

Clemson University



3 1604 019 891 748







Digitized by the Internet Archive
in 2013

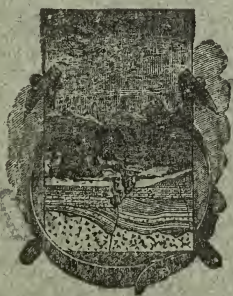
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

THE
PORCUPINE PLACER DISTRICT, ALASKA

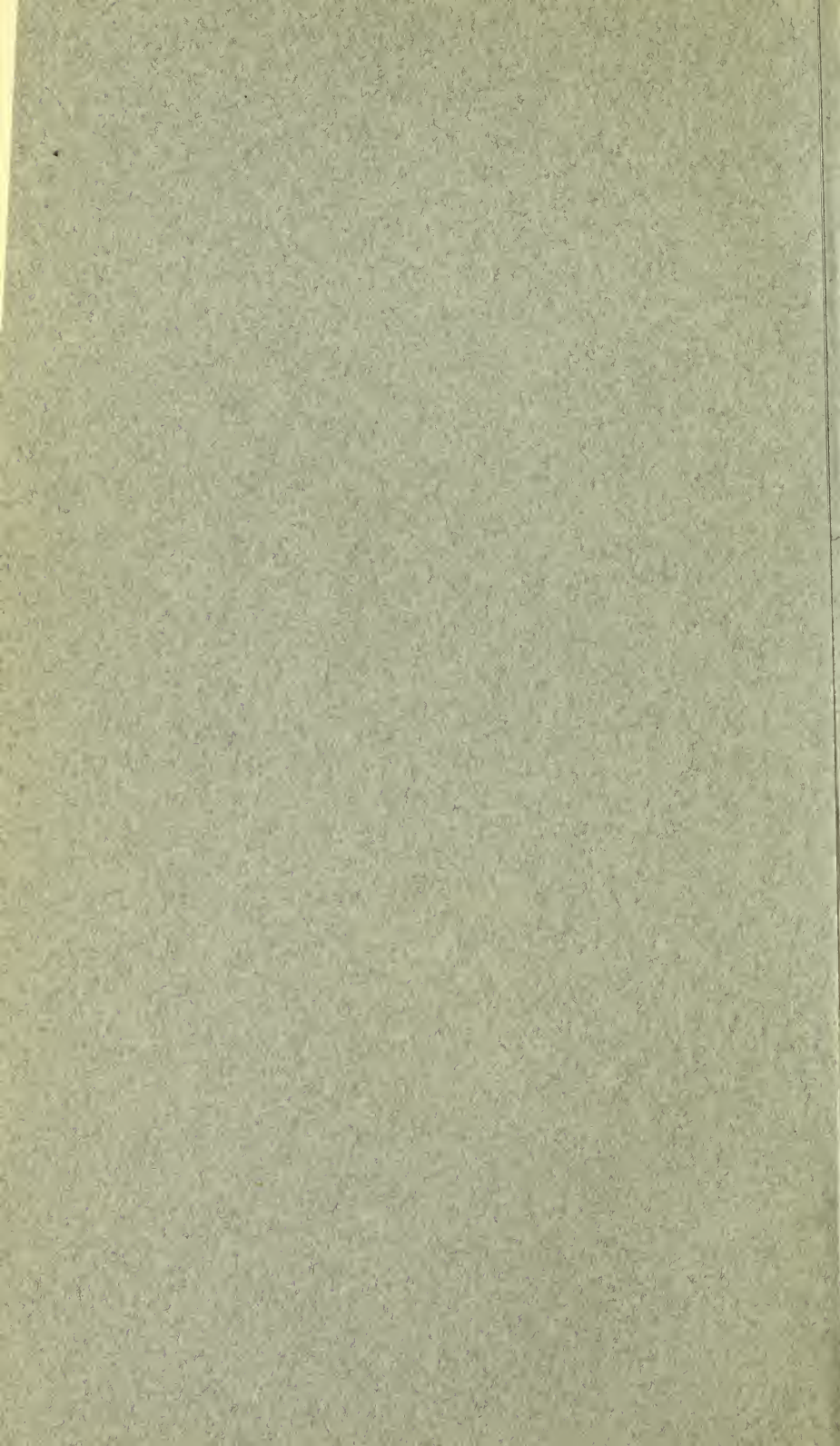
BY

CHARLES W. WRIGHT



WASHINGTON
GOVERNMENT PRINTING OFFICE

1904



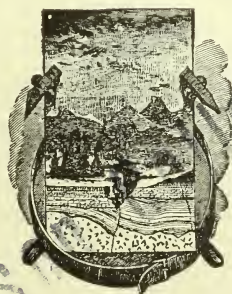
DEPARTMENT OF THE INTERIOR
UNITED STATES GEOLOGICAL SURVEY

CHARLES D. WALCOTT, DIRECTOR

THE
PORCUPINE PLACER DISTRICT, ALASKA

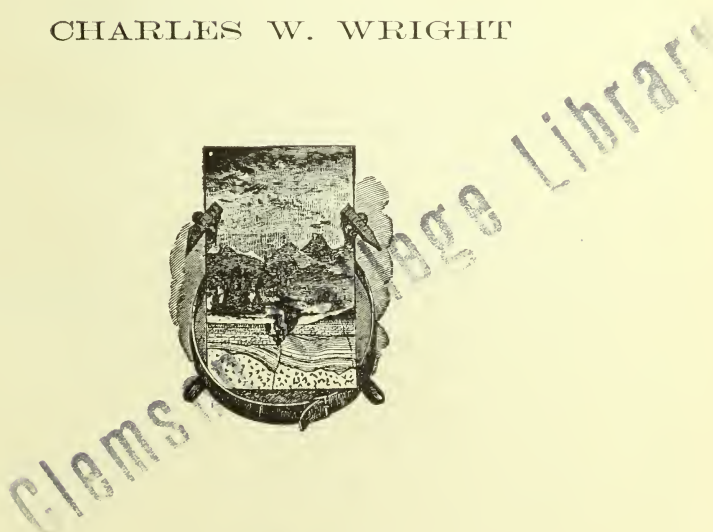
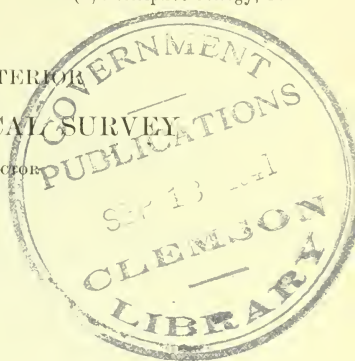
BY

CHARLES W. WRIGHT



WASHINGTON
GOVERNMENT PRINTING OFFICE

1904



CONTENTS.

	Page.
Letter of transmittal.....	7
Introduction.....	9
Itinerary.....	10
Acknowledgments.....	11
Historical sketch.....	12
Discovery.....	12
Location of claims.....	12
Neighboring creeks.....	12
Glacier Creek.....	12
Bowlder Creek.....	12
Nugget Creek.....	13
Bear Creek.....	13
Production.....	13
Topography.....	14
Mountains.....	14
Drainage.....	14
Geology.....	15
Introduction.....	15
Sedimentaries.....	16
Intrusives.....	17
Mineral occurrence.....	17
Glaciation.....	18
Economic geology.....	19
Distribution of auriferous gravels.....	19
Classification of placers.....	19
Character of gravels.....	19
Assays of samples.....	20
Source of placer gold.....	20
Developments.....	21
Description of claims.....	22
Porcupine Creek.....	22
Delta claims.....	22
Cranston claim.....	22
Discovery claim.....	23
Mix claim.....	24
Finley claim.....	24
McKinley Creek.....	24
Chisholm claim.....	24
Woodin claim.....	25
Other claims.....	26
Nugget Creek placers.....	26
Creek gravels.....	26
Bench deposits.....	27

	Page.
Rainy Hollow mining district.....	27
Methods of mining	28
Ground sluicing.....	28
Hydraulicking	29
Mining by elevators	29
Sluice boxes	29
Water supply	30
Forests	30
Trails and transportation	30
Climate.....	31
Summary	31
Index	33

ILLUSTRATIONS.

	Page.
PLATE I. Chilkat Peninsula, looking south from Mount Ripinski; Haines Mission in the foreground	9
II. Map showing location of Porcupine placer district	10
III. View of Porcupine, Alaska	12
IV. <i>A</i> , Porcupine Creek at No. 1 above Discovery claim; <i>B</i> , The head of Porcupine Creek, looking south.....	14
V. Geologic map of vicinity of Porcupine	16
VI. <i>A</i> , Bench deposit on Cranston claim; <i>B</i> , High bench deposit on Woodin claim, McKinley Creek	18
VII. <i>A</i> , Large flume, Discovery claim; <i>B</i> , Bucket elevator and sump cut into bed rock, Discovery claim.....	20
VIII. <i>A</i> , Claim No. 1 above Discovery; <i>B</i> , High bench deposit on Finley claim	22
IX. <i>A</i> , Chisholm claim, McKinley Creek; <i>B</i> , McKinley Creek Canyon, below Woodin claim.....	24
X. <i>A</i> , Hydrauliclicking at the head of Cahoon Creek; <i>B</i> , Hydrauliclicking bench deposit on Woodin claim	26
FIG. 1. Map of Porcupine Creek, showing location of claims.....	21
2. Section across Cranston claim, showing side bench deposit.....	23
3. Section of Porcupine Creek at the Finley claim.....	24
4. Section of McKinley Creek at the Woodin claim	25

LETTER OF TRANSMITTAL.

DEPARTMENT OF THE INTERIOR,
UNITED STATES GEOLOGICAL SURVEY,

Washington, D. C., March 17, 1904.

SIR: I have the honor to submit herewith the manuscript and illustrations of a report entitled "The Porcupine Placer District, Alaska," by Charles W. Wright, and to recommend its publication as a bulletin.

The Porcupine placer district lies in southeastern Alaska, adjacent to the international boundary, and the exploitation of its mineral wealth has, in a measure, been dependent on the definite settlement of the line separating Alaska and British Columbia. Now that the boundary is established, developments of the placer field will undoubtedly be rapidly extended. The district, though of no great extent, is easily accessible and promises to yield a good return if developed by economic methods.

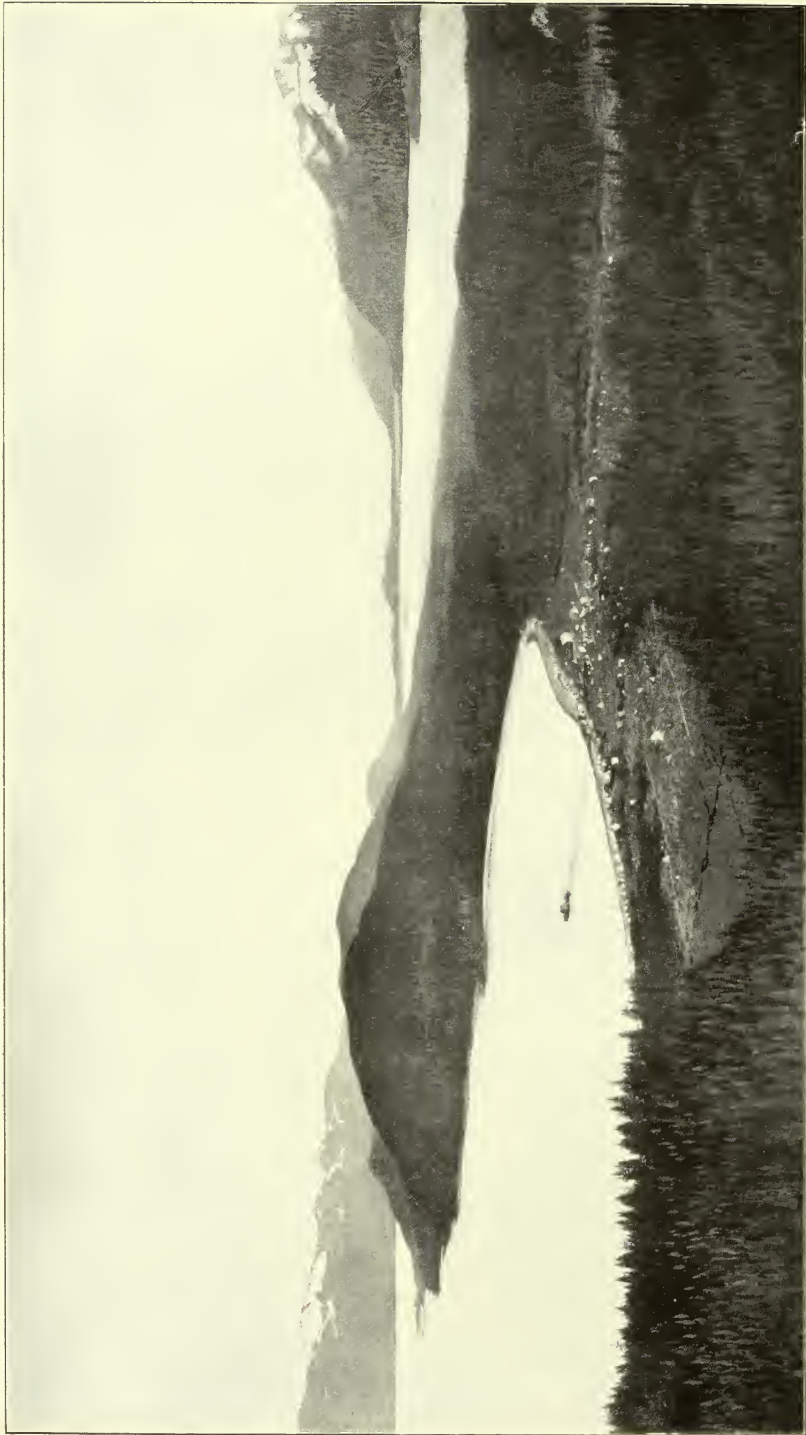
Mr. Wright spent only three weeks in this field, and his studies were, therefore, by no means exhaustive. It is believed, however, that this presentation of the facts observed and of the tentative conclusions reached will be of value to the mine operators and prospectors.

Very respectfully,

ALFRED H. BROOKS,
Geologist in Charge,
Division of Alaskan Mineral Resources.

HON. CHARLES D. WALCOTT,
Director United States Geological Survey.





CHILKAT PENINSULA, LOOKING SOUTH FROM MOUNT RIPINSKI.

Haines Mission in foreground

THE PORCUPINE PLACER DISTRICT, ALASKA.

By CHARLES W. WRIGHT.

INTRODUCTION.

The Porcupine gold field, one of the most important placer districts of southeastern Alaska, lies in a rugged mountain belt drained by the Chilkat, a river emptying into Lynn Canal. The district embraces an area of about 100 square miles, its central point being approximately in latitude $58^{\circ} 25'$ and longitude $136^{\circ} 12'$. (See map, Pl. II.)

Placer gold was discovered on Porcupine Creek in 1898, and developments begun during the following year have been continued to the present day, with a rapid increase in the output of gold, which aggregates about \$460,000. These placers lie close to the international boundary, and their extensive development has been in a measure dependent on the final settlement of its location.

In 1899 the Geological Survey dispatched an expedition to explore the northern front of the St. Elias Range and the headwaters of White and Tanana rivers. This party, under the leadership of Mr. W. J. Peters, made its way inland by the Dalton trail, passing close to the then newly discovered gold placers of Porcupine, thus enabling Mr. Alfred H. Brooks, who was attached to the party as geologist, to make a cursory examination of a few of the claims on Porcupine Creek, the results of which were subsequently embodied in his report.^a

The growing importance of this district led to a demand for a more systematic examination, and to this investigation the writer was assigned. He was instructed to make a reconnaissance of the entire field and to study its mineral resources, geology, and development, as far as time would permit. The field work occupied about three weeks, during which all claims on which any development work had been done were visited. There were no opportunities for accurate surveys, but as the region had fortunately been surveyed by the International Boundary Commission, its contoured map was used as a base, and was supplemented by foot traverses.

^a Brooks, Alfred H., A reconnaissance from Pyramid Harbor to Eagle City, Alaska: Twenty-first Ann. Rept. U. S. Geol. Survey, pt. 2, 1900, pp. 374-376.

ITINERARY.

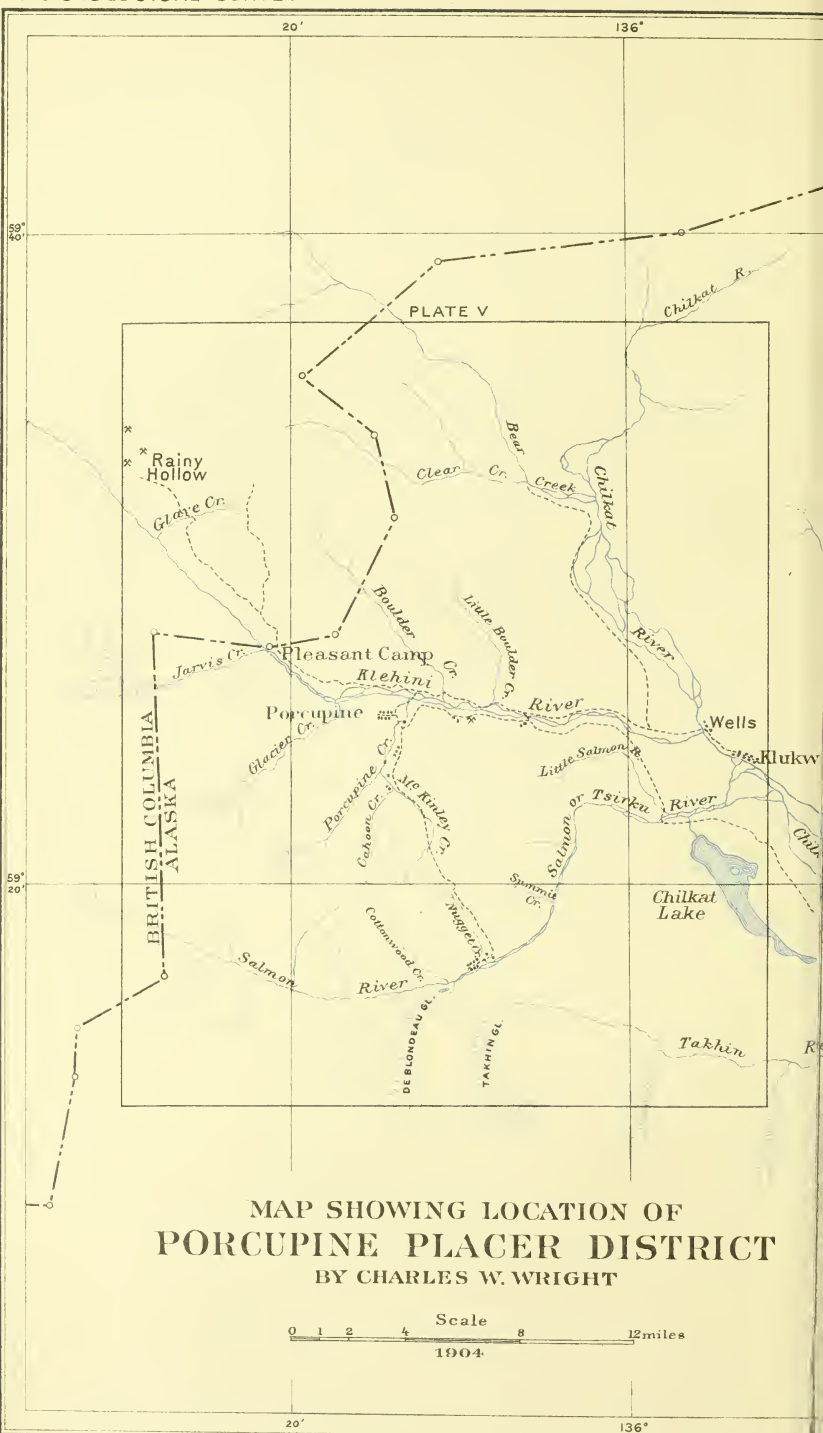
Leaving Seattle on June 23, 1903, Haines Mission, Alaska, was reached four days later. This mission, established in 1881, is pleasantly situated 17 miles below Skagway, on the protected bay of Portage Cove, and is immediately surrounded by gently sloping land. Besides the native village of about 80 huts, there are several trading stores, a drug store, a comfortable hotel—the “Northern”—and large mission buildings. The War Department is establishing an army post 1 mile south of the town. A square mile or more of ground had already been cleared and barracks were being built at the time of the writer's visit.

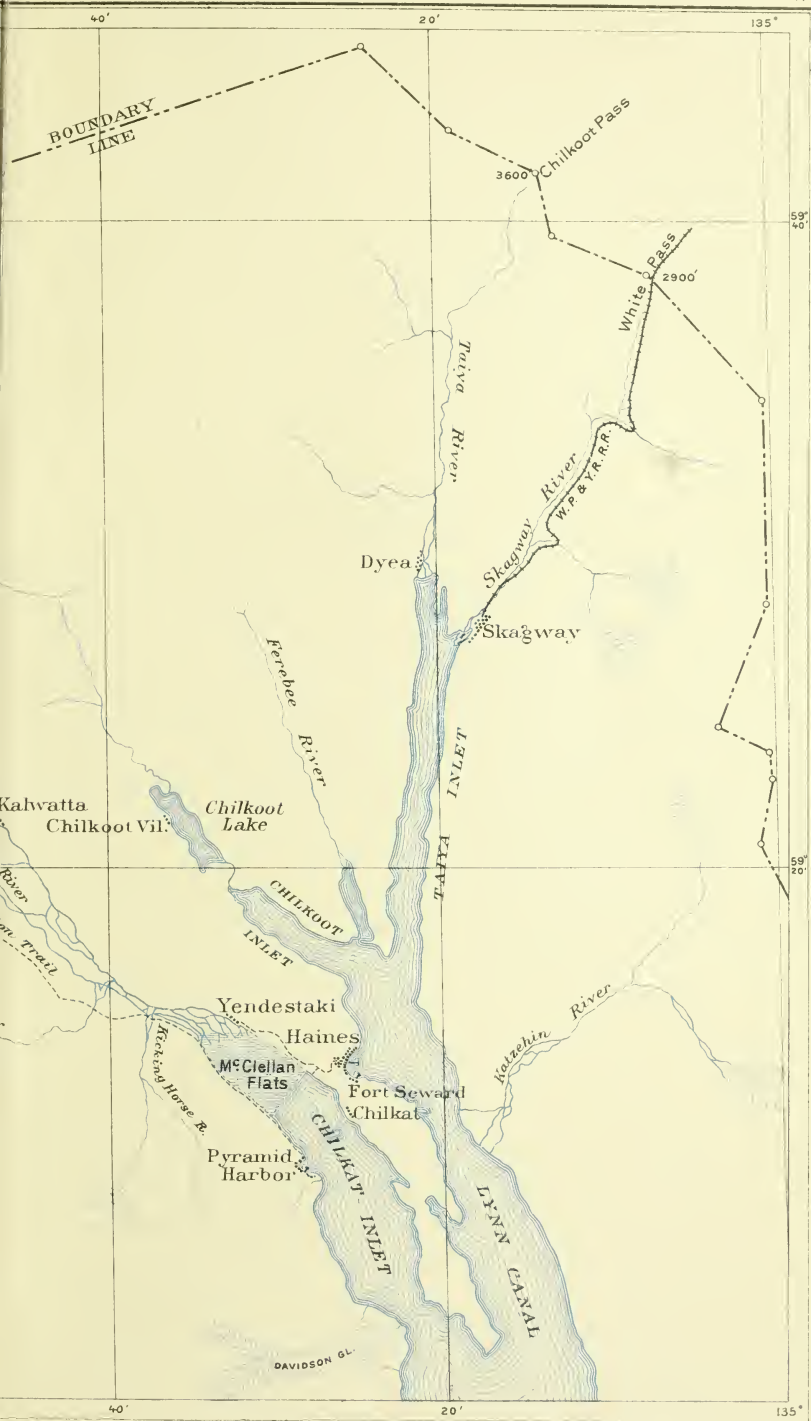
From here the Porcupine gold field may be reached either by the Dalton trail, which starts at Pyramid Harbor, on the west shore of Chilkat Inlet, or by way of Chilkat River to the Indian village Klukwan, and thence up Klehini River, a west branch of the Chilkat, to Porcupine.

The latter route was chosen, and two natives with a boat were engaged to ascend the Chilkat. It was necessary, however, to wait for a favorable south wind, the rapid current rendering it impossible even to pole upstream without the help of a sail. This delay gave time for an investigation of Chilkat Peninsula, a strip of land extending 6 miles south of Haines Mission (see Pl. I), and in times past staked by prospectors for gold, copper, and iron, though nothing worthy of development has ever been found. The country rock is a much-contorted slate, with intrusive masses of nearly black pyroxenite and hornblendite carrying an abundance of magnetic iron ore.

The portage of 1 mile to Pyramid Point, on the Chilkat, was made on the morning of June 29. Head winds encountered there made it necessary to pole the canoe along the shore for several miles to a point above the Chilkat village, Yendestaka, at the head of tide water. This slow mode of progression permitted a study of the outcrops along the east bank, which were composed of dark intrusive rock similar to that exposed farther south on Chilkat Peninsula. The valley of Chilkat River between Yendestaka and Pyramid Point broadens to form McClellan Flats, a tide-water area of numerous channels and sand bars, approximately 2 miles wide. Above Kicking Horse and Takhin rivers, tributaries from the west, the valley decreases in width and the river is divided by many wooded islands. There is a marked contrast between the rounded, barren mountains to the east and the rugged, broken peaks, mostly covered with snow and glaciers, to the west, although on both sides of the river the mountains rise to an elevation of 4,000 to 6,000 feet.

Fifteen miles above Yendestaka is the small Indian village of Katkwaltu (place of the gulls), on the east bank of the river. Six miles above Katkwaltu is Klukwan (the old town), at the mouth of Salmon





River. This point is 22 miles, as the crow flies, from Haines Mission, though by the river route the actual traveling distance is at least 30 miles. A population of 500 was reported here in 1880, but at present the total is less than 100, and this only during the winter months. A mile and a half beyond is Wells Post, a station of the Northwestern mounted police, on the Canadian side of what was then the provisional boundary. A mining recording office was established here in 1900 for the benefit of the prospectors of Rainy Hollow and Bear Creek districts. The former lies 25 miles up Klehini River, which enters the Chilkat from the west at this point; the latter, 10 miles up the Chilkat. The establishment of the boundary farther inland, however, has since led to the withdrawal of this station. At this post the night was spent, the hospitalities of the camp being extended to the writer by Captain Rant.

The following morning (June 30) the Indians were dispatched with the baggage up the Klehini to Porcupine by canoe, while the writer crossed Chilkat River and took the trail, following the north bank of the Klehini for 10 miles and then crossing the river to the town on the south slope of the valley.

Porcupine, a mining camp 550 feet above sea level, is situated on a bench about a half mile back from the river. The town, of about 80 persons, consists of Dalton's trading store, the Lindsay Hotel, and a dozen or more houses and log cabins (see Pl. III). During the winter months it is practically deserted, owing to the heavy snowfall, which prevents all operations.

After having given two weeks to a study of the placers of Porcupine Creek, July 18 and 19 were devoted to Nugget Creek, a tributary of Salmon River 20 miles above its mouth.

As the data collected during the few weeks spent in the district are far from complete, a full description of the geology and mineral resources of the region has not been attempted in this report. Nevertheless it is hoped that it may prove useful to those who are developing the district.

ACKNOWLEDGMENTS.

The writer wishes to express his gratitude for the hospitalities and aid extended to him by the many prospectors and miners of the region. Though it would be impossible to give the names of all, he is under special obligations to Capt. J. M. O'Connor, of Haines; Mr. E. B. Hanley, Mr. S. W. Mix, and Mr. C. P. Cahoon, of Porcupine; Mr. Guy Lewis, of Nugget Creek, and Captain McDonald and Doctor Fraser, of Pleasant Camp. He is also much indebted for many valued suggestions to Dr. Arthur C. Spencer, of the United States Geological Survey, under whose general direction the investigation was carried out.

HISTORICAL SKETCH.

DISCOVERY.

Placer mining in the Porcupine district dates from the summer of 1898, when locations were made by Messrs. Mix, Finley, and Wiley. These men, en route to the interior, took the Dalton trail, but, owing to high water and lack of provisions, were obliged to halt when only 15 miles up Klehini River. They camped near Boulder Creek, a tributary from the northwest, and found traces of gold in the stream gravels. Fording the Klehini to Porcupine Creek, a mile above Boulder, they discovered richer gravels and obtained small nuggets of gold. After locating Discovery and the three claims above, which have since proved to contain the richest deposits in the district, they returned to Haines Mission to record their claims and obtain supplies. As a result of these discoveries nearly a thousand prospectors are said to have visited this creek during the autumn of 1898 and the spring of 1899. In the summer of 1899, Porcupine had a population of 200, and probably as many more were camped along the various streams near by.

LOCATION OF CLAIMS.

Creek claims, 1,500 by 600 feet, were staked to the head of the Porcupine and its tributaries, McKinley, Marble, and Grizzly creeks, and a number of bench claims were located on the hillsides, some of them several hundred feet above the creek bottom. Other tributaries to Klehini River were prospected and many locations made, though the majority of these have since been abandoned, partly because of their position on the Canadian side of the provisional boundary of 1900.

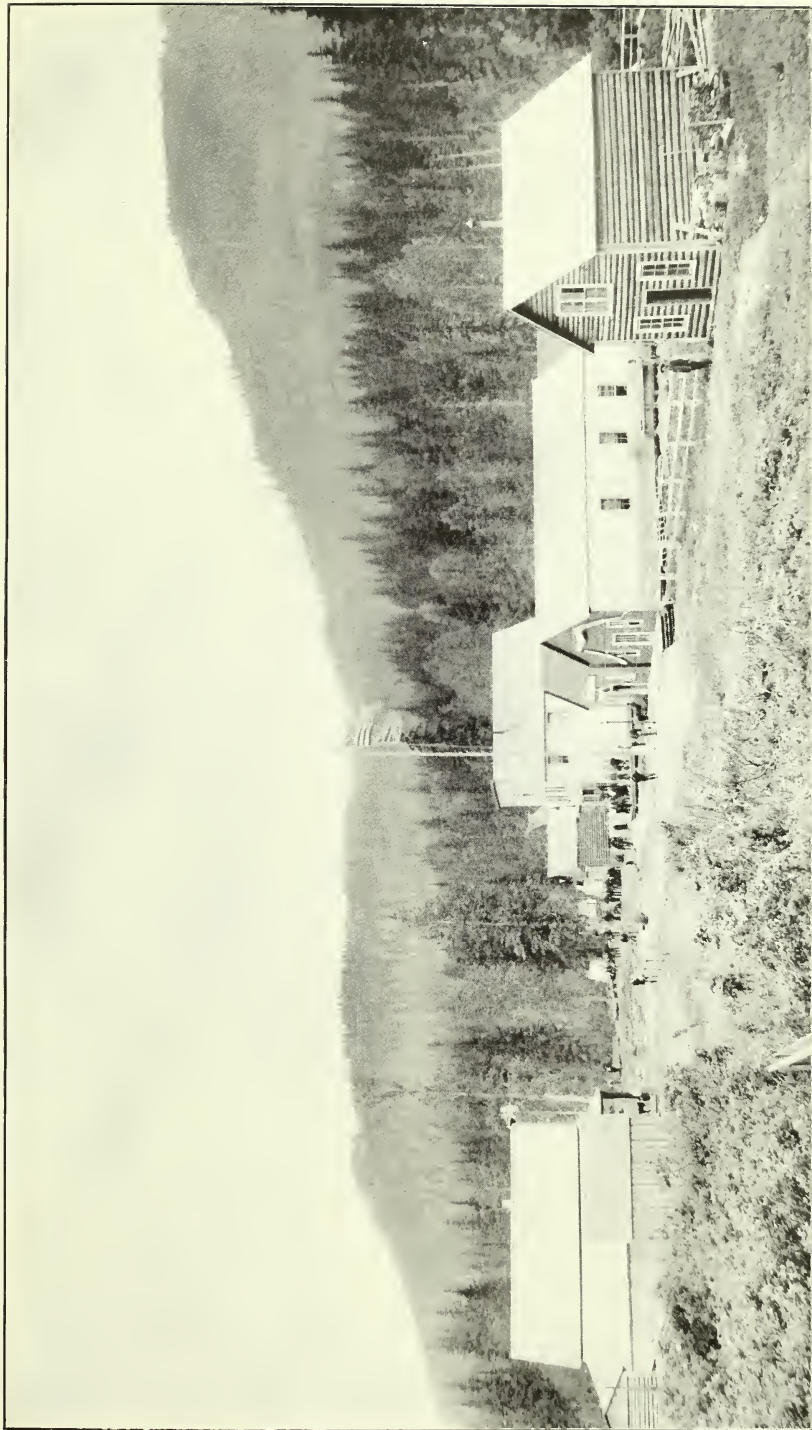
NEIGHBORING CREEKS.

GLACIER CREEK.

Of the creeks temporarily under Canadian jurisdiction, Glacier is the most important and the only one that has been carefully prospected or that has given promise of success. This creek was practically all located under the Alaskan regulations before the adoption of the *modus vivendi*, by which Americans were allowed to hold previously located claims, but owing to the uncertainty of conditions it has never been thoroughly developed. Those who did their annual assessment work have been pleased with the results obtained. The recent boundary decision throws Glacier Creek into Alaskan territory, and this will probably lead to activity during the season of 1904.

BOWLDER CREEK.

Boulder Creek enters Klehini River from the north, opposite Porcupine Creek. Here likewise a number of claims were staked under



VIEW OF PORCUPINE, ALASKA.

Alaskan regulations, but no developments were made, and no claims are held at present. Gold occurs in the gravels of this creek, but probably not in sufficient quantity to warrant mining operations.

NUGGET CREEK.

Nugget Creek, a tributary of Salmon (Tsirku) River, lies about 20 miles from Klukwan and 6 from Porcupine, across the divide from McKinley Creek. It was discovered in 1899 by C. H. Anway, who first found gold along the banks of Salmon River, and later discovered coarse gold in both Nugget and Cottonwood creeks, on which he located claims. Development work was not undertaken until 1902.

BEAR CREEK.

The last of the known gold fields in the Chilkat drainage basin is Bear Creek, a western tributary of Chilkat River, 40 miles north of Chilkat Inlet. Fifteen miles above its mouth Bear Creek is joined from the west by Clear Creek. Both of these streams caused excitement in 1900, but have not thus far been productive. This has been chiefly due to the difficulties in controlling high water in the creeks, the extreme depth of bed rock, and the presence of quicksand. There are still a few miners on these streams, and the fact that they remain suggests the presence of payable gravel. This area is now Alaskan territory and many claims have been restaked by Americans, who will begin operations in the spring of 1904.

PRODUCTION.

The gold production of the placer diggings on Porcupine Creek and its tributaries since their discovery in 1898 has been approximately as follows:

Gold production of the Porcupine region to date.

Year.	Value.
1898.....	\$1,000
1899.....	9,000
1900.....	50,000
1901.....	110,000
1902.....	140,000
1903.....	150,000
Total.....	\$460,000

TOPOGRAPHY.

MOUNTAINS.

The mountains of the Porcupine district are an eastern wing of the lofty St. Elias Range. Viewing the region from one of the summits the general aspect is that of a high plateau dissected by numerous deep and narrow valleys. The surrounding peaks are rugged and precipitous, from 5,000 to 7,500 feet in elevation, below which glaciers and fields of snow fill the uppermost parts of the valleys and canyons. The mountain slopes, which rise gradually, with no abrupt benches or terraces, have all been rounded by moving ice, and there is evidence to show that all but the highest peaks were once buried beneath a continuous field of ice and snow.

DRAINAGE.

Of the many rivers entering Lynn Canal the Chilkat is the largest, draining, with its tributaries, the country within 60 miles of its mouth at Chilkat Inlet. Most of its waters come from melting glaciers and snow fields. Near its head it runs through a canyon-like valley extending down to the mouth of Bear Creek, a western tributary, but from this point flows in many channels over a broad gravel flat. It has built a delta 2 miles wide at its mouth and is slowly filling up the head of the inlet. The eastern slope of its lower basin is very abrupt and is characterized by rounded peaks of intrusive rocks, averaging 5,500 feet in elevation, while to the west the bank rises to a densely wooded ridge of 1,500 feet elevation, composed mainly of slate, back of which are high, snow-covered mountains.

The most important tributaries of Chilkat River are the Klehini, the Salmon (Tsirku), and the Takhin, named in order of size. The first named is a rapid river, averaging 100 feet in width and rarely exceeding 5 feet in depth. Eighteen miles from its mouth it, like the Chilkat, changes from a gravel filled valley a quarter of a mile or more in width to a comparatively narrow, steep-sided canyon. Its waters are seldom confined to one stream, but are divided by many gravel bars into a network of interlacing channels. Its main channel is continually shifting, rendering canoeing or sailing up the river difficult to the inexperienced navigator. Many of the smaller streams, flowing at right angles to the river, are glacier-fed mountain torrents, too steep and rapid for canoes, and often impossible to ford during high water, even near their sources.

At the mouth of Porcupine Creek is a gravel deposit extending 1 mile to the westward and lying from 60 to 80 feet above the river bed; this deposit probably represents a former delta of the creek, having been built up when the river was at that height. On this terrace the town of Porcupine has been built.



A. PORCUPINE CREEK AT NO. 1 ABOVE DISCOVERY CLAIM.



B. HEAD OF PORCUPINE CREEK.

Looking south.

Chilkat Lake, at the mouth of Salmon River, and two other lakes which fill basins at elevations of 1,200 and 800 feet in the hills just east of Porcupine, are probably the result of damming, either by glacial moraines or by alluvial gravels.

The accompanying map (Pl. II), giving the main watercourses and their tributaries, is taken for the most part from the unpublished map made by the Boundary Survey Commission in 1892, though a few necessary corrections have been made as accurately as possible from foot traverses and topographic sketches.

GEOLOGY.

INTRODUCTION.

The geologic reconnaissance of southeastern Alaska^a has led to the recognition of certain fairly well-defined belts of rocks extending parallel to the coast line, which have a striking lithologic uniformity along the extension of their strike. The great igneous complex which forms the country rock of the Coast Range is the best defined of these belts, stretching from British Columbia throughout southeastern Alaska. While the dominating rock of this mass is of a granitic appearance, and was so designated by Dawson^b and others, microscopic studies have shown it to be more closely related to dioritic rocks. West of this Coast Range igneous belt are found metamorphic rocks of various types which will probably eventually be differentiated into a number of formations. The age of these metamorphic terranes is not definitely determined, but probably falls largely in the Paleozoic.

The area under discussion contains both sedimentary beds, usually considerably metamorphosed and probably falling into the above-described zone of altered elastics, and igneous intrusives of the Coast Range zone.

The general distribution of the sedimentary and intrusive rocks of this region is shown on the accompanying geologic map (Pl. V). The Porcupine district lies a few miles southwest of the Coast Range dioritic belt, which is here about 80 miles across. Adjacent to this on the south is a zone, 8 miles wide, occupied principally by metamorphic black slates, phyllites, and limestones, with strongly developed cleavage parallel to the general northwest-southeast trend of the diorite contact, this being also the general direction of Klehini Valley. This sedimentary series is limited on the south by an outlying band of diorite from 2 to 4 miles in width, also striking northwest and southeast. This diorite band narrows toward the southeast, extending in this direc-

^a Brooks, Alfred H., Preliminary report on the Ketchikan mining district, Alaska: Prof. Paper U. S. Geol. Survey No. 1, 1902. Speneer, Arthur C., The Juneau gold belt: Bull. U. S. Geol. Survey No. 225, 1904, pp. 28-43.

^b Dawson, G. M., Report on an exploration in the Yukon district and northern British Columbia: Ninth Ann. Rept. Geol. Survey Canada, vol. 3, pt. 1, 1888, p. 128.

tion only to Salmon River, where it disappears. Porcupine and other gold-bearing creeks of this district lie mainly in the sedimentary rocks, though their upper portions cut into the diorite band to the south. This band has been the source of the large boulders contained in the creek wash (Pl. VI).

SEDIMENTARIES.

The sedimentary rocks, as before stated, consist of a series of slates with interbedded limestone. The slates are mostly black; some of them soft and rich in graphite, others hard and flinty, while adjacent to the limestone beds they are usually more or less calcareous. The limestones are sometimes fossil bearing, but as a rule they show evidence of considerable dynamic action, which has contorted and pressed the shells so that it is difficult to recognize their original form. The general strike of the sedimentaries is N. 60° W., dipping 75° NE., though this varies greatly. The beds are often wrinkled and folded, but apparently on a small scale, as no repetition of groups of strata was observed. The diorite contact usually follows the stratification, though in some places the intrusive masses crosscut the slates. Next to the diorite the slate has been baked and altered to a flinty hornstone for a width of several hundred feet. Similarly the limestone beds have also suffered alteration to white fine-grained crystalline marble. A good example of this is shown just back of Pleasant Camp (See map, Pl. V).

A small collection of fossils gathered from a stratum of limestone on Porcupine Creek were determined to be of lower Carboniferous age by Dr. G. H. Girty, of the United States Geological Survey. The following is an abstract from his report:

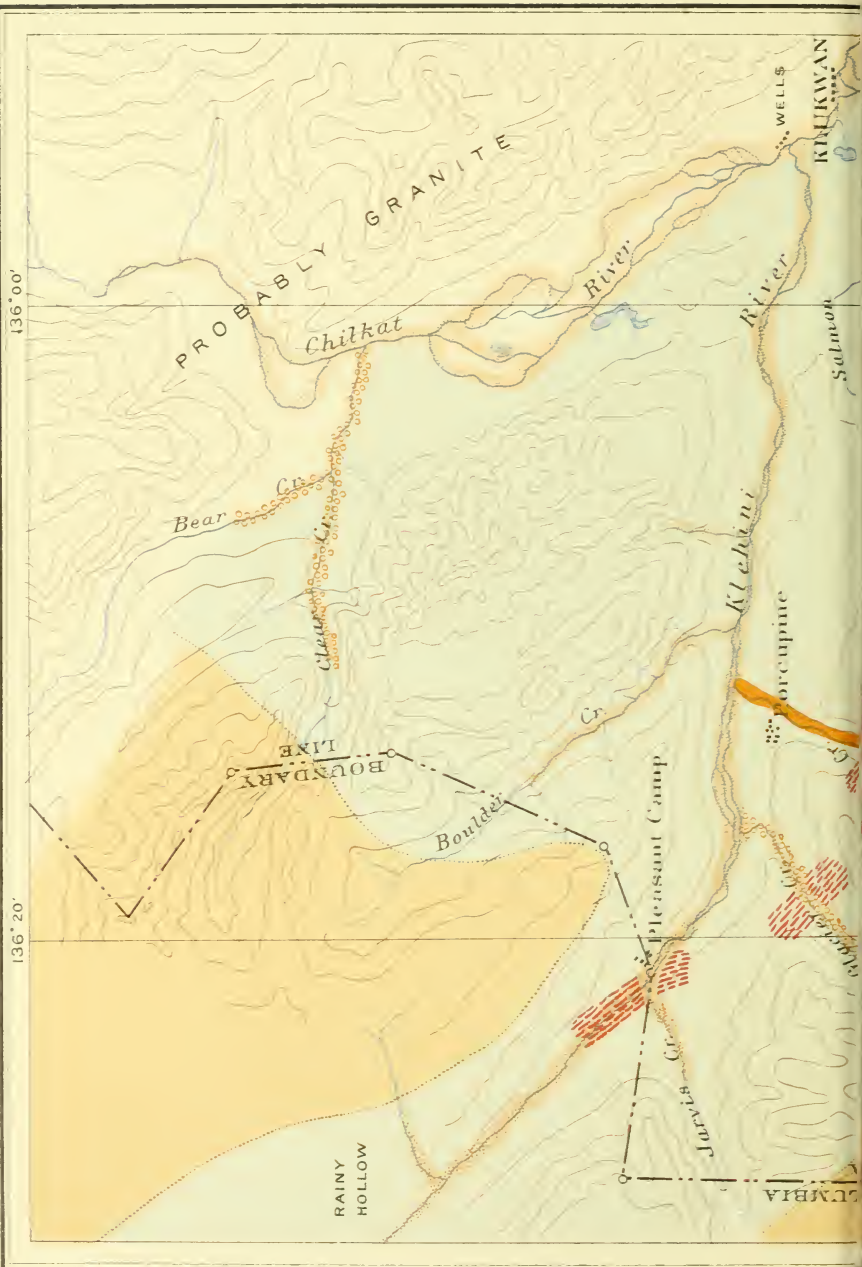
The forms identified are:

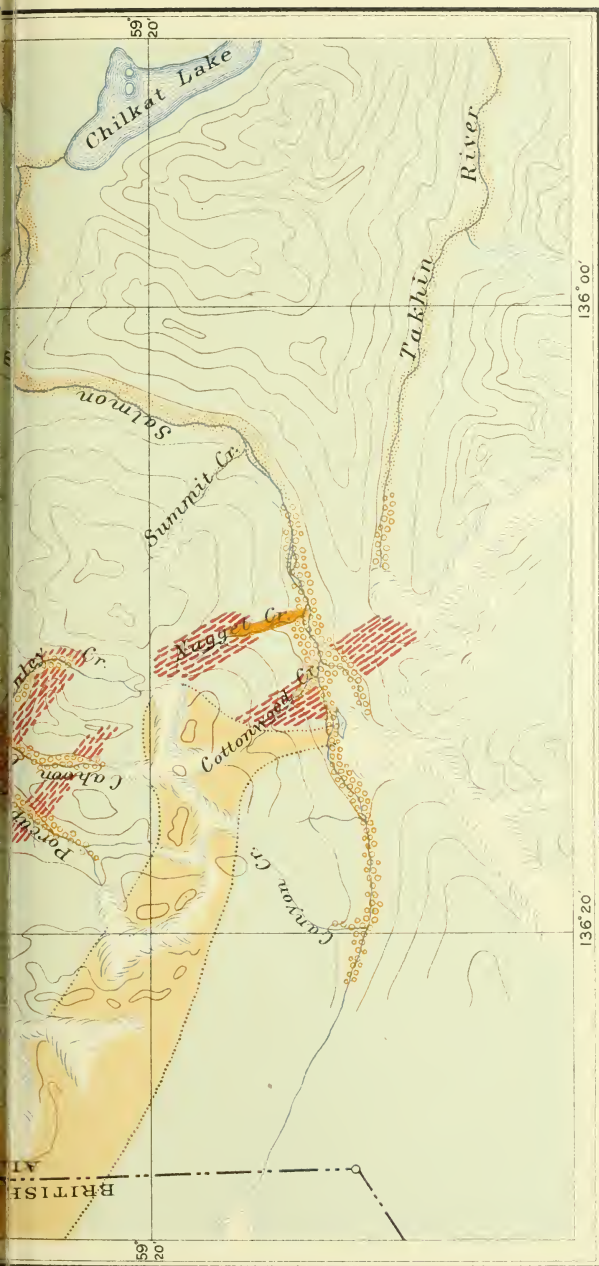
Crinoidal fragments.	<i>Spirifer striatus</i> .
<i>Productus latissimus</i> .	<i>Camarophoria</i> ? sp.
<i>Productus semireticulatus</i> .	

The age is clearly Carboniferous, and though I hesitate to offer a further opinion upon a fauna which is more or less strange, I believe that it is of lower Carboniferous age. The faunal type, however, is that of the lower Carboniferous of the west coast, and not that of the Mississippi Valley and Eastern States. I believe that it is to be correlated with the later portion of the lower Carboniferous of the Mississippi Valley, or even that it is somewhat younger. Lower Carboniferous horizons have already been reported from Alaska, but the present fauna is not precisely the same as any of those so far discovered.

In a report on the Ketchikan mining district Mr. Brooks^a calls attention to a coral found in the débris of Dirt Glacier of Glacier Bay, which was determined by Mr. Schuchert as belonging to the Carboniferous age. This district, however, is 40 miles south of Porcu-

^a Brooks, Alfred H., Preliminary report on the Ketchikan mining district, Alaska: Prof. Paper, U. S. Geol. Survey No. 1, 1902.





ECONOMIC GEOLOGY OF THE VICINITY OF PORCUPINE

BY CHARLES W. WRIGHT

From *International Boundary Commission*.

LEGEND



Granite



Shales and limestones



Mineralized areas
as far as determined



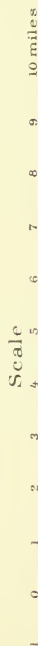
Gravels believed not
to be of economic
importance



Gravel deposits
known to be gold
bearing



Gravels producing
placer gold



Contour interval 1000 feet

1904

pine, and as the intervening rocks are unknown, a correlation of the sedimentary formations in the two areas is hardly advisable without more thorough investigation.

INTRUSIVES.

The rock of the Coast Range intrusive belt in this region is mainly a coarse-grained diorite of a light-gray color, composed of plagioclase feldspar, hornblende, some biotite, and a little quartz, though specimens collected from different places vary in composition. The main mass north of Klehini River corresponds with the description above. The narrow belt at the head of Porcupine Creek contains more biotite, and segregations of hornblende and mica are often prominent, causing large dark spots, which are locally characteristic. The continuation of this belt to the east at Cottonwood Creek is characterized by a microcline feldspar and a larger amount of quartz. Under the microscope some of the minerals are seen to have been crushed, indicating that since the intrusion of the diorite they have been subjected to pressure and movement. This diorite rock is locally termed granite, which it resembles very closely and from which it can be distinguished only by careful examination.

In the central part of the sedimentary series there are several cross-cutting greenstone dikes, averaging 10 feet in width and often traceable for several hundred feet. They are green in color, fine grained, often porphyritic, and under the microscope were determined to be altered diabase, occasionally mineralized. The relative ages of the diabase and the diorite could not be determined, as the two were not found in contact.

On the north bank of the Klehini, seemingly interbedded in the slate, there is a greenstone schist forming a bed about 40 feet wide. Aside from this no schists were observed in the district.

MINERAL OCCURRENCE.

The sedimentary rocks have all been more or less mineralized by stringers and veins of quartz and calcite, but an especially noteworthy impregnation of iron sulphides forms an interrupted zone of mineralization in the southern portion of the sedimentary series. The sulphides in the slates occur as films or frequently as lenticular masses a few inches in width, parallel with the bedding. Two samples of the mineralized slates, one an average across several feet and the other from a rich seam, gave respectively \$0.41 and \$2.48 per ton in gold. Samples from near the mouth of the Porcupine, where the slates are apparently unmineralized, taken by Mr. Brooks during his short visit to this region in 1899,^a gave traces of both gold and silver.

^a Brooks, Alfred H., op. cit., p. 374.

The quartz veins are not very abundant, and as a rule are short and small, often merely stringers parallel with the structure of the slates. A few which cut directly across the formation carry galena and sphalerite, with a small amount of chalcopyrite, and, though quite narrow, often persist for considerable distances. Calcite veins, which are more numerous than those of quartz, are usually a foot or more in width, and are often weathered to a light-brown color on the surface, while of a bluish color and fine granular structure when freshly broken. They often carry cubes of pyrite, which occasionally measure an inch across. From veins of this nature up McKinley Creek some native gold has been reported.

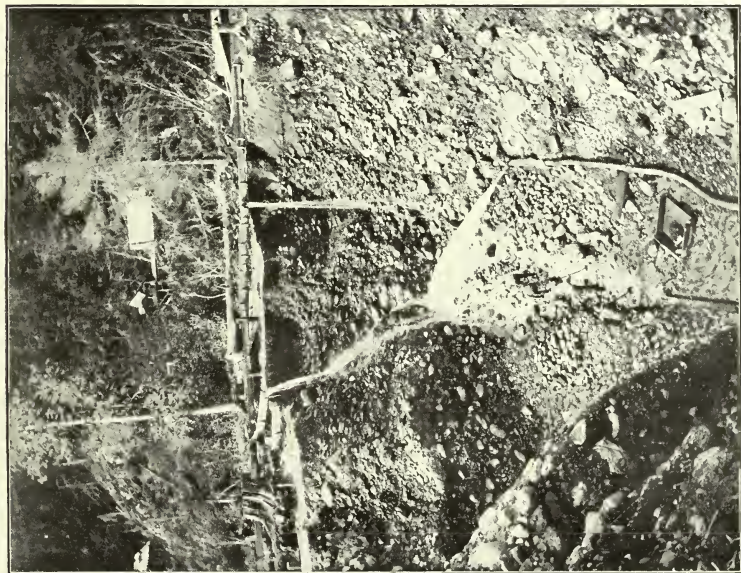
Besides the small veins a quartz ledge 100 feet wide outcrops at an elevation of 2,000 feet on the ridge south of Porcupine. Although apparently quite barren, a small sample from this gave an assay value of \$5.28 in gold. A similar ledge occurs across the Klehini at 1,500 feet elevation, on the ridge west of Boulder Creek. About 2 miles below Porcupine is a third mineralized deposit rich in sulphides, with calcite as gangue mineral, but a sample taken here gave an assay value of only 41 cents. These different ledges have all been located and relocated, and on some assessment work has been done, but none have been developed, owing to transportation difficulties.

GLACIATION.

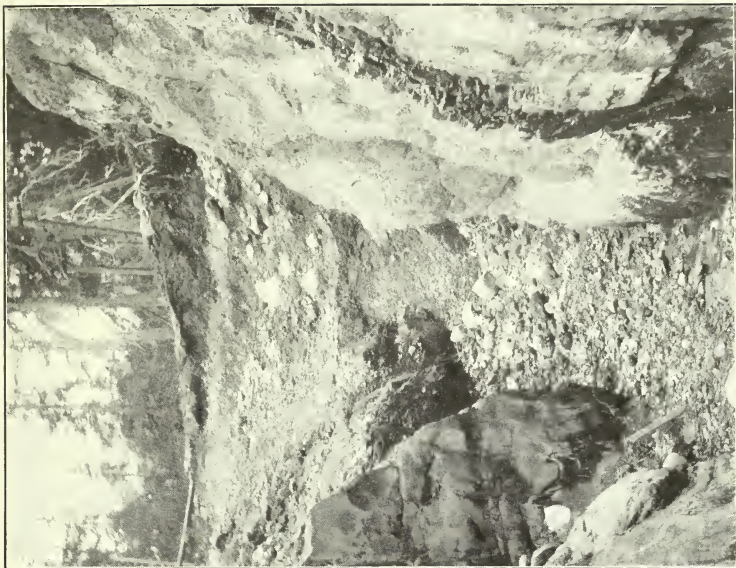
Evidence of general glaciation was found over the greater part of the area explored. Observations show that the entire district was formerly covered by a field of ice similar to that now existing to the north of Muir Glacier, with only the highest, most rugged peaks protruding. The greatest altitude at which the action of ice was observed was 4,500 feet, on Granite Mountain just west of Boulder Creek.

The main dissection of the country is attributed to water erosion previous to the Glacial epoch, but many of the topographic features, such as rounded ridges and wide U-shaped valleys, are attributable to the action of ice. Of especial interest are the high gravel-filled channels on the mountain slopes several hundred feet above the present creeks. These channels have probably been formed by a field of moving ice, which cut troughs into the bed rock along the trend of the softer interbedded slate strata. During the retreat of the ice from the valleys gravels were deposited in these channels, which, owing to later erosion of the creek bottoms, have been left at high elevations on the valley slopes. At about 200 feet elevation above the present creek, on the south bank of the McKinley, a deposit in one of these channels is being hydraulicked. This is crossed by the present creek canyon, exposing a good section of the gravel bed (Pl. VI, *B*).

The concentration of gold in the placers has no doubt been going on in the different streams ever since their lower valleys were vacated by



1. BENCH DEPOSIT ON CRANSTON CLAIM



2. HIGH-BENCH DEPOSIT ON WOODIN CLAIM, MCKINLEY CREEK

streams of ice. Previous to melting, the glaciers were mainly eroding, and few, if any, local deposits could have been formed until they began to retreat. As they gradually disappeared, the materials which they ground off from the bed rock, with other *débris* furnished by tributary streams, have been concentrated in the creek beds by the sorting action of flowing water, thus forming valuable placers.

ECONOMIC GEOLOGY.

DISTRIBUTION OF AURIFEROUS GRAVELS.

The geologic map (Pl. V) shows the distribution of the gold-bearing gravels. It will be observed that the deposits actually producing gold are confined to the creeks which crosscut the areas of mineralized slates, and that neighboring valleys contain no valuable amounts of gold. The auriferous gravels on the Poreupine extend to the junction of McKinley Creek and up this tributary for a distance of 1 mile. Gold is limited to the lower claims on Nugget Creek, and a similar occurrence may be expected on Glacier Creek, though this has not been sufficiently prospected to determine the local distribution. The gravels of the tributaries entering Klehini River from the north are believed to be of no economic importance.

CLASSIFICATION OF PLACERS.

There are three types of gravel deposit in the Poreupine basin—creek gravels, side benches, and high benches. The creek gravels fill the present channel to various depths and can not be definitely separated from the side benches or gravel banks which rise in places 20 and 30 feet above the stream. The high gravels occupy portions of former channels which in some places have been preserved and in others have been cut out by the downward erosion of the streams.

The first of these side-bench deposits, at No. 2 below Discovery, is an extensive gravel bed on the east side, 25 feet above the creek. Rich gravels occur at high benches 80 feet above the creek on the first three claims above Discovery, and a similar deposit has been found on the south bank of McKinley Creek, three-quarters of a mile from its mouth, at an elevation of 200 feet. Of the above types the creek gravels, as those found on Discovery claim and those near the mouth of McKinley Creek, are of greatest value.

CHARACTER OF GRAVEL.

The stream and bench gravels consist mainly of a fine wash containing worn slabs and fragments of slate, and rounded boulders often 2 or 3 feet in diameter, mostly of diorite, with some greenstone. In the upper portions of the creeks the gravel wash becomes coarser and more angular. There are no materials in the gravels which could not have been derived from the drainage basin in which they occur.

ASSAYS OF SAMPLES.

Hardly enough material was taken to assure reliable commercial tests, but the presence of gold in all the samples indicates the advisability of careful prospecting for lode deposits. The following list gives the assay values of several samples from quartz ledges, mineralized slates, etc., in the vicinity of Porcupine:

Assay of mineralized quartz, slate, etc., from Porcupine district.

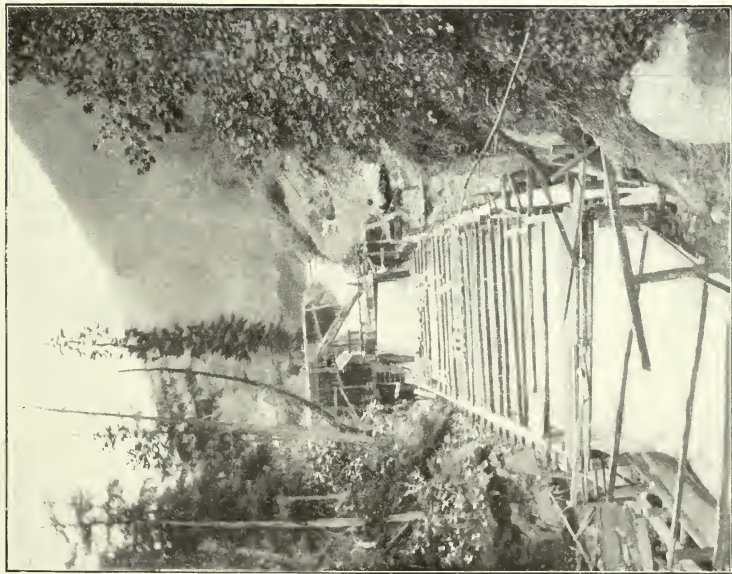
No.	Gold.	Silver.	Value.	Locality.
	<i>Oz. per ton.</i>	<i>Oz. per ton.</i>	<i>Per ton.</i>	
1	0.12	0.08	\$2.48	Mineralized slate, Porcupine Creek.
2	.02	Trace.	.41	Mineralized slate 1 mile north of Pleasant Camp.
3	.26	Trace.	5.37	Large quartz ledge on ridge back of Porcupine.
4	.06	.08	1.28	Large quartz ledge on north bank of Klehini River.
5	.02	None.	.41	Prospect 2 miles east of Porcupine.
6	1.10	.08	22.78	Glacial mud, Cranston claim; sample taken at random.
7	266.60	68.32	5,544.20	Black sand concentrate, from sluice boxes, Nugget Creek.

Though a large amount of black sand has been thrown away in the past, its value is now generally recognized. The test given merely emphasizes the wastefulness of the rough methods of mining which have been employed. The sample marked "glacial mud, Cranston claim," was taken from a layer of rock flour and small pebbles, several feet thick, occurring between two beds of gravel. Too much importance, however, must not be placed upon the high assay of this material, which was taken at haphazard, but it suggests that careful tests of the so-called glacial muds should be made.

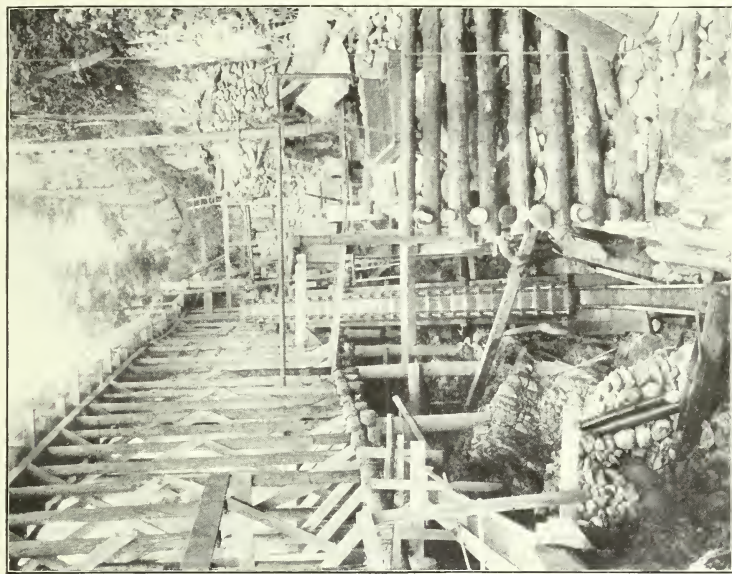
SOURCE OF PLACER GOLD.

The gold from Porcupine basin is well worn and flattened, occurring in flakes or small nuggets, and is but rarely rough and irregular. Its assay values are reported to vary from \$16.80 on McKinley Creek to \$17.20 on the lower portion of Porcupine Creek. It is of a bright yellow color, though some of the finer gold on the lower claims has a dull bronzy appearance. Nuggets of an ounce weight are not unusual, and one piece is reported weighing 8 ounces.

It is generally believed by the discoverers and operators that the gold of Porcupine and Nugget creeks has been brought from some distant source. The supposed necessity of this view is urged from the coarseness and worn condition of the nuggets, and from the absence of coarse gold and of more than small amounts of free metal in any of the local veins. The importance of these facts can not be overlooked in



.A. LARGE FLUME, DISCOVERY CLAIM.



.B. BUCKET ELEVATOR WORKING IN BED-ROCK SUMP.
DISCOVERY CLAIM.

attempting to determine the origin of the gold, but it is difficult to show the possibility of any outside origin, because the deposits are so limited in extent. If the gravels, with their gold contents, had been brought into these creeks by glaciers, there would be no reason for the observed concentration in one stream and the absence of gold in adjacent gulches. This and the fact that pay gravels are not found in the upper portions of the gold-bearing creeks above the mineralized slates, nor in the diorite belt, strongly suggests that the gold has been derived from the surrounding country rock.

The problem is quite similar to that presented by the auriferous gravels of the interior and of Seward Peninsula, where the local source of the gold concentrated in the placers is usually accepted.

Natural washing and re-concentration of the auriferous bench deposits by small tributary streams has contributed a large amount of gold to the gulch gravels. This explains the occurrence of rich deposits in potholes and the irregular distribution of gold in the gravel beds.

DEVELOPMENTS.

After the rush to Porcupine Creek in 1898-99 but little development was undertaken until 1900, when several claim

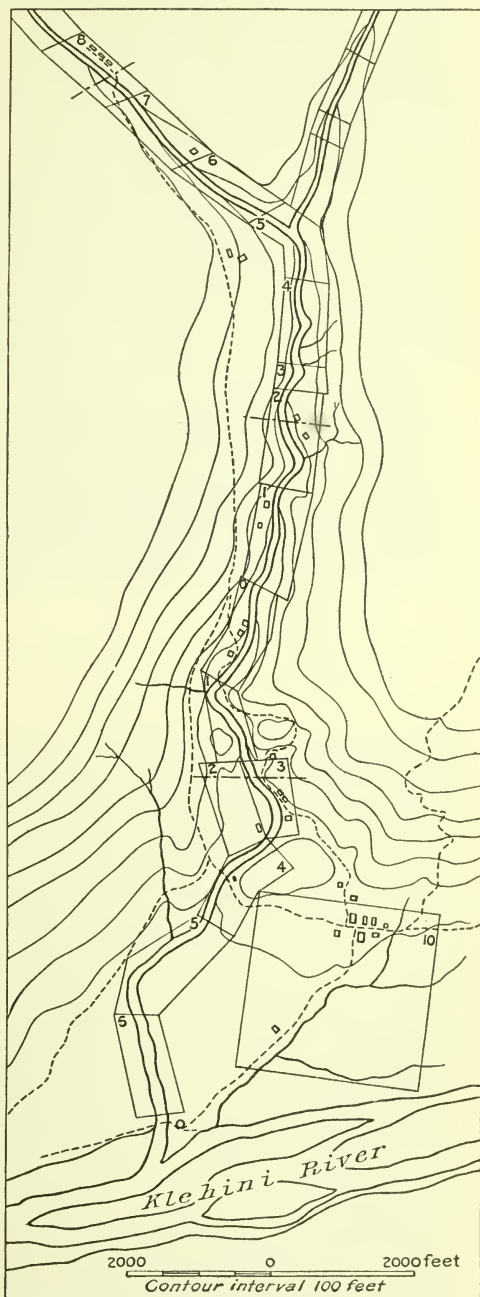


FIG. 1.—Map of Porcupine Creek, showing location of claims.

holders bonded or leased their properties, while others formed companies in order to operate on a large scale. The conditions to be met require a still further combination of interests for economic exploitation, and negotiations are now being made to bring the entire creek under a single management.

The extensive gravel bed of Klehini River is known to contain some gold, though no comprehensive tests have been made to show its probable value. Dredging would seem to be the only practicable method of mining this deep deposit.

In describing the placer properties those at the mouth have been first considered, while the claims following are referred to in regular order (Pl. VII).

DESCRIPTION OF CLAIMS.

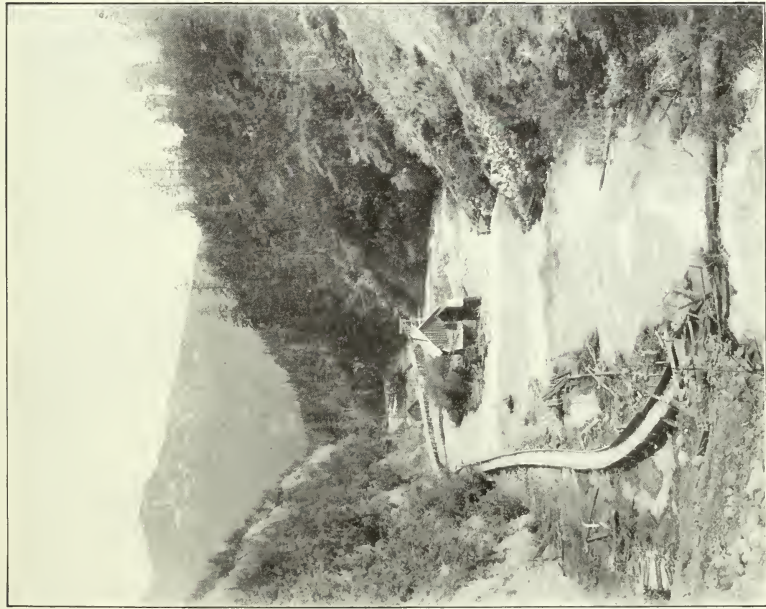
PORCUPINE CREEK.

Delta claims.—On the western bank of the Porcupine, near its mouth, the gravel bench formed by the old delta was formerly all staked, though at present only the claims neighboring the creek are held, and on these no more than the required assessment work has been done. The depth of the deposit is unknown and the few test pits on the several claims are said to have given only low values.

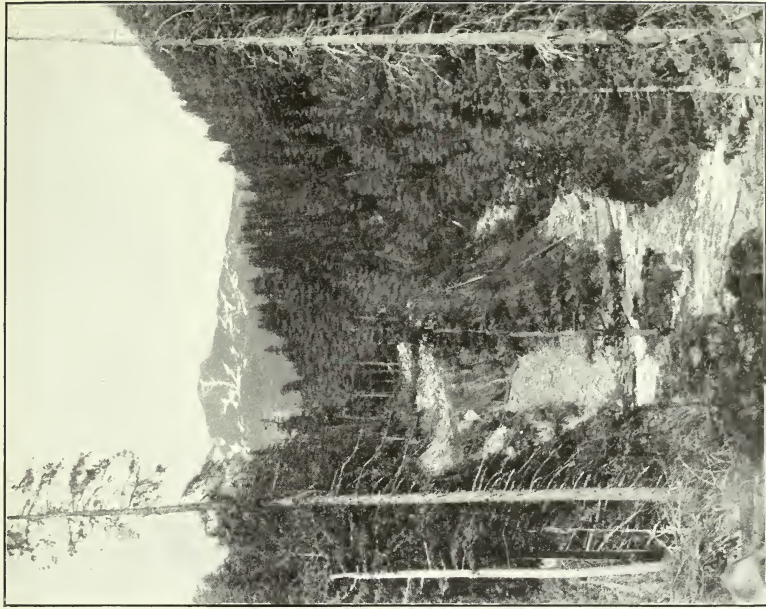
Cranston claim.—This claim, the first on the creek under development, is 1 mile from the mouth of the Porcupine. The gravel bed is 40 feet in depth, the top of the deposit forming a bench on the east side 20 feet above the stream. The gravels are said to carry good values, but the gold is not uniformly distributed. Next to bed rock is a layer 2 to 3 feet deep carrying high values in gold, though this is sometimes cut off by ridges in the bottom of the channel. Overlying this is a 15-foot bed less rich in values, containing many quartz pebbles and some bluish clay. The next 2 feet are of clay and small gravel wash, probably of glacial origin. Though this material was supposed to be quite barren a sample submitted to fire assay gave a value of over \$20 per ton, showing this stratum to be worthy of closer examination. Above the clay there is 15 to 20 feet of yellow gravel, averaging 150 feet in width and carrying good values (fig. 2).

Besides gold, platinum is said to occur in the black sands, but a laboratory test did not verify the report. Galena, magnetite, chalcopyrite, some arsenopyrite, and a large amount of pyrite occur in the concentrates.

To develop this property a flume 1,200 feet in length was built along the creek bank, supplying the hydraulic hose used to work the gravels and furnishing power for the bucket elevator, centrifugal pump, and sawmill. A 6-horsepower derrick, receiving power from a steam engine, has been installed to hoist bowlders too large for the



A. CLAIM NO. 1 ABOVE DISCOVERY.



B. HIGH BENCH DEPOSIT ON FINLEY CLAIM.

bucket elevator. At the lower end of the claim a pit has been sunk and into this the gravels are washed, going first through a narrow sluice box, which gathers the coarse gold, and then into a sump cut in the bed rock. From this sump the bucket elevator lifts the gravel to the recovery sluice boxes on the surface (Pl. VI, A).

An old creek channel 65 feet above the Porcupine, at the upper end of the claim, was formerly worked, and \$3,000 is said to have been recovered, though the greater part of its gravels remain unworked, owing to the difficulty in getting water to that elevation. The development of this claim has been done by lessors, who expect large returns the coming season (1904).

On the next claim above, in 1901, a pit 20 feet deep was sunk which exposed 80 square feet of limestone bed rock; \$10,000 is said to have been taken out. During a period of high water the excavations were filled in, and the property has not been worked since.

Discovery claim.—The bed rock, which here crosses the creek diagonally, striking N. 60° W., consists of alternate beds of flinty and

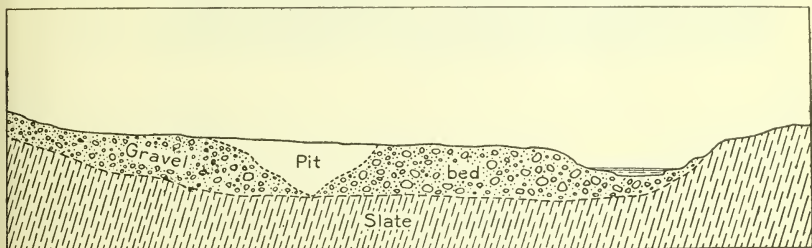


FIG. 2.—Section across Cranston claim, showing side-bench deposit.

graphitic slate, in which natural troughs have been formed. The gold has been concentrated in these natural riffles, and often nuggets have worked down into the softer slate for 2 or 3 feet. The creek gravels on this claim average 12 feet in depth, with no definite layers, excepting that most of the pay dirt lies on bed rock. Gold was first discovered in a small gravel bench 30 feet above the creek on the west bank; \$15,000 was taken out with shovel and sluice box from an area 10 by 30 feet.

The stream has been diverted into a flume 20 feet wide, 5 feet deep, and 1,400 feet long, with a $3\frac{1}{2}$ per cent grade; through this the water rushes at a rate of from 3,000 to 5,000 miner's inches per minute. About 100 feet above the outlet of the flume a pit has been sunk and a sump 10 feet deep excavated in bed rock. All the gravels are worked down through a short sluice box, which saves the large nuggets, into this sump, and are then lifted by a bucket elevator, of 4,000 cubic yards capacity per twenty-four hours, to the surface sluice boxes. A water wheel receiving power from a small flume drives the

elevator, pump, derrick, and a sawmill. It is planned to continue the pit upstream until sufficient grade is secured for ground sluicing. When the stream is confined the current will doubtless be able to carry off the tailings (Pl. VII).

Mix claim.—On this property work is being done on a gravel bench from 20 to 80 feet wide and 8 feet deep, occurring on both sides of the creek about 60 feet above the stream. The valley widens at the lower part of the claim, and a broad bed of creek gravels has been deposited (Pl. VIII, A). The claim was leased by a mining company during the summer of 1901, but the operations did not prove successful and no further developments have been undertaken. At present part of the upper bench is leased to a miner, who has recovered many nuggets of gold.

Finley claim.—The deposit here is on the same bench as the one below. The gravel bed is 100 feet wide, 6 to 10 feet deep, and 80 feet above the creek. In 1901 a large production was reported from this property, but it is not operated at present (Pl. VIII, B; fig. 3).

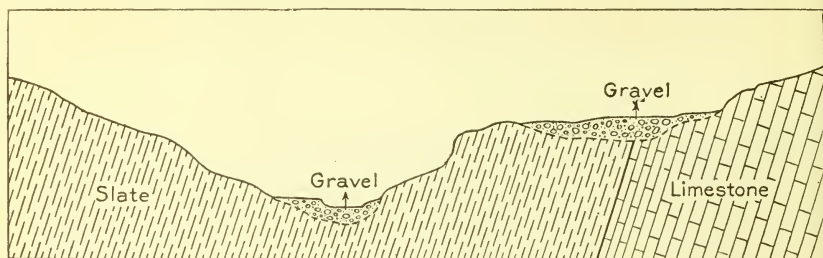


FIG. 3.—Section of Porcupine Creek at the Finley claim.

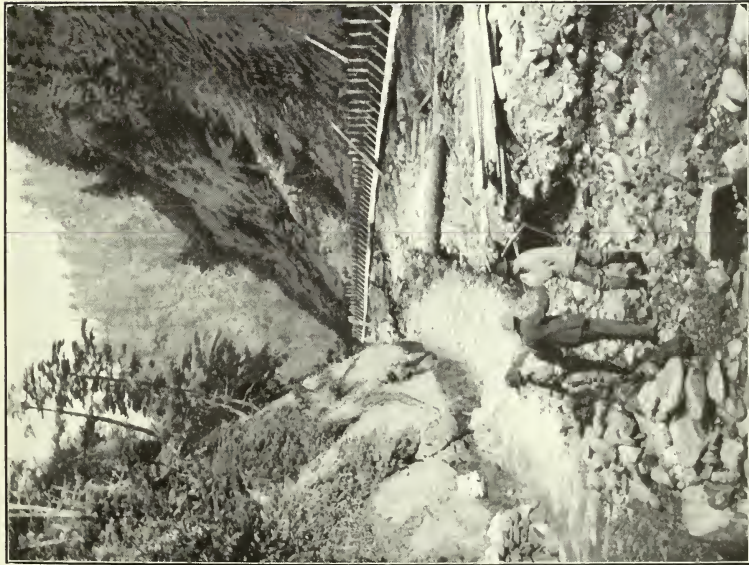
On the Legal Tender fraction, an extension of the Finley bench, a good section of the channel with the gravel deposit is exposed. One man working with a 6-foot sluice box was making good wages.

Following this is the Wiley claim, which corresponds in character to the Finley claim; no development work has been done on the bench at this place.

MCKINLEY CREEK.

At the junction of McKinley and Porcupine creeks the first location is the Lewis claim, joining the Wiley property and extending 800 feet along the Porcupine to the forks, thence 500 feet up McKinley Creek. A hundred paces above the forks there is a waterfall about 60 feet high, known as the McKinley Falls, below which good values have been found.

Chisholm claim.—The next claims in succession are the Chisholm and Hall properties, owned by the United Gold Mining Company. On the former of these, where the placer deposit is being exten-



A. CHISHOLM CLAIM, MCKINLEY CREEK.



B. MCKINLEY CREEK CANYON BELOW WOODIN CLAIM.

sively developed, a good example of ground sluicing may be seen (Pl. IX, B.) The stream is diverted into a 600-foot flume built along one side of the creek, and the large bowlders from the bed are piled along the banks or are used to form a narrow channel in which to confine the stream and increase its velocity. Through this the water is turned from time to time and its rapid current carries much of the gravel downstream. Thus the surface gravels are gradually removed and the gold is concentrated in a shallow deposit on bed rock, from which it is easily recovered. Very good returns are expected from this claim at the end of the season when bed rock is cleaned up. A small saw-mill is the only machinery used on the property.

Woodin claim.—The Woodin claim and several others are owned by the McKinley Creek Mining Company. The first work on this property was on the creek bed, but in 1903 all operations were confined to a high bench deposit on the south side of the valley, 200 feet above the creek bed. The gravels fill two parallel channels, one 15 feet deep and 40 feet wide, the other 30 feet deep and 30 feet wide. In the

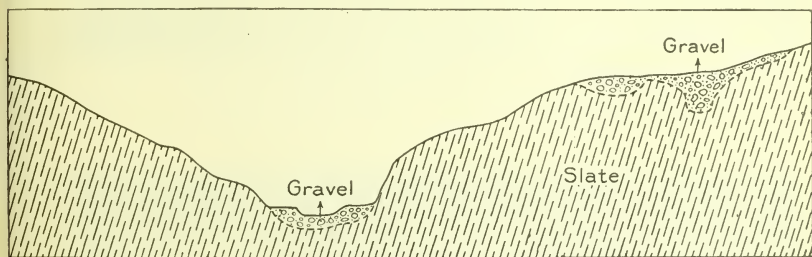


FIG. 4.—Section of McKinley Creek at the Woodin claim.

deeper of the two a good section of the gravel deposit is shown (fig. 4; Pl. VI, B). Next to bed rock there is gravel wash, consisting of diorite cobbles and slate fragments, which contains good gold values. Overlying this there is a deposit of blue clay or rock flour some 3 feet deep, carrying logs and branches of trees, and regarded so valueless. Above the clay are several feet of coarse wash, capped by a bed of gravel cement 2 to 3 feet thick. This cemented gravel or hardpan can not be disintegrated by the hydraulic stream, and is even difficult to loosen with hammer and pick. The gold is coarse, not so much worn as that of the Porcupine, and somewhat higher in silver values.

The property borders an area of mineralized slates, containing many calcite veins, with some crosscutting quartz veins, all of which are heavily charged with pyrite. A sample of the well-mineralized slate gave \$2.48 in gold per ton. To develop this property sluice boxes have been placed along the bottom of the channel, and through these the gravels are washed by a hydraulic giant, capable of working

down the bench deposit within a radius of 200 feet. A ditch leads the water from the upper part of Cahoon Creek to a penstock 400 feet above the workings, from which a pipe line supplies the giant and furnishes power for an overhead trolley, which carries the large bowlders to a dump at the lower end of the claim (Pl. X, B).

Other claims.—Higher up on the south slope of the McKinley other bench deposits have been investigated, but nothing of importance has been reported. The creek deposits above Woodin claim have not been developed sufficiently to prove their value, though some unsuccessful attempts were made to work claims on Cahoon Creek (Pl. X, A). It is claimed by some of the prospectors that there is no pay on the Porcupine above the forks, nor beyond the mouth of Cahoon Creek on the McKinley.

NUGGET CREEK PLACERS.

Nugget Creek camp may be reached either by going up Salmon River some 20 miles, or by way of Porcupine, over the divide at the head of McKinley Creek. This creek rises in the same ice field which feeds McKinley Creek, and flows through a narrow canyon-like valley for a distance of $2\frac{1}{2}$ miles into Salmon River. Like nearly all the tributaries of Salmon River, few of which are more than 2 or 3 miles in length, it enters from the north.

Creek gravels.—The gravels of the present creek bed and the low side benches form the principal deposits in Nugget Creek. The former occur as rich pockets, filling the small glacier-scooped basins, commonly called potholes. The low bench deposits are usually very narrow and show more or less well-defined beds, a section through which would be as follows: On bed rock a 2-foot layer of glacial mud; above this a foot or more of cemented slate wash; then a 10-foot bed of pay dirt, consisting of large and small gravel wash; and capping this a few feet of rock slide and surface dirt. Many large angular blocks of diorite, several feet in diameter, occur in these creek gravels, adding greatly to the cost of mining.

Seven claims have been staked on these creek deposits, two below and four above Discovery; the latter, however, is the only one which has been developed. To work the gravels on this claim the stream has been diverted into a flume, freeing the creek bottom and furnishing power for a derrick of considerable capacity, which handles the large diorite bowlders. A pipe line, fed from an upper flume, supplies water under a 200-foot head to the hydraulic plant by which the gravel banks are worked down through long sluice boxes 2 feet wide resting on bed rock. During the two years of development encouraging results are reported, and it is believed that future exploitation will yield large returns.



A. HYDRAULICKING AT HEAD OF CAHOON CREEK.



B. HYDRAULICKING BENCH DEPOSIT ON WOODIN CLAIM.

Bench deposits.—No extensive deposits have been found in the tributary creeks, but along Salmon River between Nugget and Cottonwood creeks is a bench deposit, probably marking a former river level, which has an average width of 1,500 feet and is from 20 to 40 feet above the present river. The greater part of the bench has been located, and plans are being made to work it by drifts and raises, using underground sluices supplied with water from Nugget Creek.

Near Nugget Creek the bed of Salmon River, over which the river flows in many channels, is a mile in width. Colors of gold may be obtained along this gravel deposit from a point a mile below Nugget Creek to above Cottonwood Creek. Fifty or more claims were staked last summer (1903) on these river bars, and an attempt will be made next season to work parts of the extensive deposit by dredges.

RAINY HOLLOW DISTRICT.

It was no part of the purpose of the present investigation to study the copper deposits of Rainy Hollow, but as opportunity was offered a brief visit was made to this district, which has since been included in British Columbia by the newly established boundary line.

Rainy Hollow is the name given to the basin at the head of Klehini River, where the only lode prospecting in the Chilkat drainage has been done. The ores are copper and silver, very little gold having been found. The valley gradually ascends to dome-shaped hills, covered on the lower levels with a luxuriant growth of small trees and plants, but on the upper levels almost barren of vegetation. The country rock consists of very much disturbed black slates and limestones, crosscut by greenstone and porphyry dikes.

There are several well-defined ledges, striking mainly north and south. Those investigated were nearly vertical contact leads, lying between a limestone and an intrusive greenstone. They were composed chiefly of pyrrhotite, chalcopyrite, galena, and sphalerite, with quartz as gangue mineral. The Custer ledge, averaging 3 feet in width, can be followed for 2 miles over the mountain ridge; and the parallel Hartford ledge, separated from it by a greenstone dike 80 feet wide, may be traced nearly as far, although it is much more broken and faulted. The present surface ores are the richer sulphides of copper. No iron capping occurs over the veins, and oxides and carbonates of copper are not often found, and where observed are mere films, obviously due to surface weathering.

About 2 miles west of the Custer and Hartford ledges are some others less well defined and little developed. They are, however, richer in copper and silver, and are reported to be of greater value than either of the first mentioned, which can be of no economic value until transportation facilities are greatly bettered.

The first locations here were made in September of 1898 by Joe Chisholm. During the following spring and summer a number of prospectors came into this region and located all the surrounding hillsides, without discrimination. Many have been abandoned and the properties still owned represent only a few of the original number. Several tunnels of various lengths have been driven on the Custer ledge, which prove it to be very persistent in depth, as the outcrops show it is along the strike.

A detailed description of the claims staked in 1899 is given in the annual report of the Minister of Mines of Canada for 1900. The following assay is quoted from his report: "A general sample over 3 feet of the Custer ledge gave an assay of gold 50 cents, silver 2 ounces, copper 1.2 per cent, lead 3 per cent, zinc 5.5 per cent."

METHODS OF MINING.

On Porcupine Creek one finds the primitive methods of recovering gold ordinarily employed in partly developed placer districts. The miners have been obliged to make much out of little. With implements such as picks, shovels, whipsaws, and canvas hose, which they are able to carry to the place of working, they build ditches, flumes, and sluice boxes, and install small hydraulic plants. Under these conditions the richest deposits are sought out and worked, though frequently with little economy. When available pockets have been exhausted work comes to a standstill, claim holders cease developing and do only annual assessment work, with the expectation of eventually selling out to companies who can consolidate interests and mine on an extensive and economical basis. During the last few years, however, several small sawmills have been erected by different parties, large flumes have been built, and hydraulic plants and bucket elevators installed; but equipments are still insufficient and no progress had been made toward consolidation up to the close of the season of 1903.

GROUND SLUICING.

As the best pay dirt is usually at the bottom of the creeks, it is necessary to remove the overlying gravel wash by some economical method. The stream must first be diverted into a flume built up on trestle work or running on one side of the creek. The creek bottom being freed from water, the large bowlders are piled along the banks of the stream, those too heavy to move being broken by sledge hammers and powder. A narrow channel built up of bowlders is thus formed, which serves to confine the stream and increase its velocity, so that on being turned back into the creek bed it is able to carry off material which it could not otherwise have moved. The miners often enter this swift-flowing stream and by the use of shovels help the larger rocks downstream and off the claim. From time to time the

water is diverted into the flume, so that the large boulders may be thrown out or broken up. Where the creek bed is wide this temporary channel, continually eating its way downward, must be moved, step by step, from one side of the creek to the other, then perhaps back again in case the gravels are deep. In this way the mass of gravel is disintegrated and washed away and the gold is concentrated in a shallow deposit on bed rock. To clean up the bed rock, sluices are laid, beginning at the lowest point on the claim, and into these the enriched gravels are worked by means of wing dams and shoveling. As the work progresses upstream additional boxes are supplied.

HYDRAULICKING.

In the upper channels, as at the Woodin claim, the gravels have been attacked where the present canyon crosses the former stream bed. The gravel at the mouth was hydraulicked away and sluice boxes laid on bed rock, everything being worked into these sluice boxes by the powerful stream from the hydraulic nozzle. The large boulders are transported to the mouth of the channel by a trolley moving on a cable which extends the length of the workings (Pl. X, *B*).

MINING BY ELEVATORS.

Where there is insufficient fall in the creek, or where deep potholes occur which necessitate a lifting of the gravel, bucket elevators are used. A pit is first sunk to bed rock, into which a sump is excavated, and in this the wash collects, to be elevated to the sluice boxes above. When sufficient space is cleared a small sluice box placed in the bottom of the pit collects most of the coarse gold (Pls. VI, VII).

SLUICE BOXES.

The boxes used in the pits are usually 12 feet in length, tapering from a width of 18 inches at the upper end to 14 inches at the lower end, thus allowing them to fit into one another. The larger sluice boxes used above surface are 2 to 3 feet wide and from 50 to 100 feet long.

Riffles of several sorts are in use. An ordinary form is made by fitting round blocks 4 inches thick, sawed from logs a foot or more in diameter, into the boxes. Another style consists of poles placed a half inch apart lengthwise in the bottom of the sluice box. Still a third sort is made of sawed strips of wood placed crosswise, and set at an angle with the bottom of the box, so as to overhang on the upstream side. It is customary to have two or three sets of the pole style at the head of the sluice, and below these the block riffles. All of the riffles are held in place by wedges of wood, so that they can be removed for the clean up, which begins with the uppermost set of riffles, the concentrates finally collecting on the lowest box.

WATER SUPPLY.

The flow of water in the different creeks varies with the seasons and also during the day. Most of it comes from glaciers and snow fields, and on warm, sunny days it is usually one-third less in the morning than in the afternoon. The high-water season is usually in the middle of summer, not in the spring as might be expected on account of the melting of the snow. Low water is during the months of May, June, October, and November. In the winter most of the creeks freeze over and are covered with snow, but a small stream continues to flow under the ice. Porcupine Creek has a flow varying from 2,000 to 5,000 miner's inches per minute, and an average fall of 6 feet per hundred, or a total of 2,200 feet in the 7 miles of its course.

FORESTS.

The timber consists chiefly of hemlock, spruce, a few cedars, and occasional pines, besides an abundant growth of cottonwood on the river bottoms. The lower hills and mountain slopes are usually wooded to an elevation of 2,000 or 2,500 feet above sea level. During the winter months the sawmills are supplied with logs averaging not over 2 feet in diameter, mainly of spruce, and in early spring these are sawed and used for buildings, flumes, and sluice boxes. A dense undergrowth of weeds known as "devil's club," and of alders, covering the lower portion of the hills, hinders walking and makes prospecting difficult.

TRAILS AND TRANSPORTATION.

The usual route to the district formerly followed from Haines Mission was the Dalton trail, which has its starting point at Pyramid Harbor, on the west side of Chilkat Inlet, but this road is only practicable for travelers on horses, because of the difficult fords across Takhin and Salmon rivers. Another trail leads along the east bank of the Chilkat to Wells Post, where the Chilkat is crossed by canoe, and thence along the north bank of Klehini River to opposite Porcupine. This, generally known as Throp's trail, is used during the months of low water in the early spring and autumn. During the summer months it is best to wait for a favorable wind and sail upstream. Native canoemen are always available, and their services are necessary to those not familiar with the river.

Freight and supplies are usually moved in during the months of winter and early spring, when the snow and the frozen condition of the streams greatly facilitate transportation. In the summer Indians are hired to transport the freight in their canoes as far as Wells Post, from which it is carried on wagons by a fairly easy route along the banks of Klehini River to Porcupine.

CLIMATE.

No climatic records have been kept of the particular area under discussion. The inhabitants claim that the winters are more severe than in the parts of southeastern Alaska nearer to the open ocean and more directly influenced by the Japan Current. Heavy snowfalls begin late in October, and in places accumulations in the gulches do not disappear before the first part of June. The line of perpetual snow is about 5,000 feet above the sea, and many of the valleys have small glaciers at their heads. During the summer months, however, the climate is more pleasant than that prevailing along the coast, and the precipitation is considered to be less.

SUMMARY.

The gold-bearing gravels in this vicinity are confined to the few creeks and benches within an area of 5 miles in width and 10 miles in length, extending from Nugget Creek on the Salmon to the mouth of Porcupine Creek on the Klehini. Belts of mineralized slates included in this area are crosscut by the streams, and from these the gold has been derived. The workable deposits vary from 25 feet to several hundred feet in width and are from a few feet to 40 feet or more in depth.

The gold-producing gravels on the Porcupine extend to the junction of McKinley Creek and up this tributary for a distance of 1 mile. On Nugget Creek the gold is limited to the lower claims.

The creek gravels are the most valuable; from information available they average several dollars to the cubic yard, though in local bonanzas much higher values are obtained. In the bench deposits lower values may be expected. The extensive river beds are known to contain some gold, but are of so low value that dredging would probably be the only profitable method of working them.

While some of the deposits on the lower claims of the Porcupine have been considerably developed, the greater number remain untouched, and to obtain the greatest yield from them it will be necessary to combine operations and work the various claims under one management by more economical methods than are at present employed.

INDEX.

	Page.		Page.
Acknowledgments, list of	11	Cottonwood Creek, discovery of gold on ...	13
Anway, C. H., discovery of gold by	13	Cranston claim, description of	22-23
Army post, establishment of	10	section across	23
Assays, from Porcupine district, table of...	20	view of	18
Bear creek, claims staked on	13	Custer ledge, assay of ore from	28
course of	13	description of	27
difficulties on	13	Dalton trail, route of	10, 30
gold of	13	Dawson, G. M., cited on Alaskan geology..	15
rush to	13	Delta claim, description of	22
Black sand, occurrence and value of	20	Developments in Porcupine district, extent	
Boundary, international, change of	11, 12	of	21-27, 28, 31
Boulder Creek, claims staked on	12-13	on Nugget Creek, extent of	26-27
course of	12	on McKinley Creek, extent of	24-26
gold of	12-13	on Porcupine Creek, extent of	22-24
rush to	12-13	on Salmon River, projection of	27
Brooks, A. H., cited on Alaskan rocks	15	Dikes, greenstone, occurrence of	17
cited on Dirt Glacier fossil	16	Diorite, occurrence and character of	15-17
cited on Porcupine slates	17	Dirt Glacier, fossil from	16
examination of gold placers by	9	Discovery, claim No. 1 above, view of	22
gold-bearing samples collected by	17	claim No. 1 above, Porcupine River at,	
report by	9	view of	14
Cahoon, C. P., acknowledgments to	11	Discovery claim, description of	23-24
Cahoon Creek, mention of	26	view of	20
view on	26	Drainage of Porcupine district, character of	14
Calcite veins, occurrence and character		Elevations on Chilkat River, mention of ...	10, 14
of	18	Elevators, use of, in mining	29
Carboniferous age, rocks of	16-17	view of	20
Chilkat Lake, origin of	15	Erosion in Porcupine district, character of.	18-19
Chilkat Peninsula, character of	10	Explorations in Porcupine district, account	
examination of	10	of	9, 12
view of	9	Field work in Porcupine district, by C. W.	
Chilkat River, drainage of	9	Wright, length of	9
elevations on	10, 14	Finley, —, exploration by	12
location of	9	Finley claim, description of	24
rocks along	10	section at	24
source, course, and character of	14	view of	22
trail by	10	Flumes, construction of. <i>See under claim</i>	
valley of	10	<i>names, and under Developments.</i>	
Chisholm, Joe, location by	28	Forests, extent and character of	30
Chisholm claim, description of	24	Fossils, in Porcupine district	16-17
view of	24	on Dirt Glacier	16-17
Claims in Porcupine district, location of...	12	Fraser, Doctor, acknowledgments to	11
in Porcupine district, map showing...	21	Galena, occurrence of	22
Claims on Porcupine Creek, location and		Geologic map of vicinity of Porcupine. <i>See</i>	
development of	21-22	Map, geologic	16
Clear Creek, mouth of	13	Geological Survey, exploration by	9
Climate, character of	31	Geology of Chilkat Peninsula, character of.	10
Commission, International Boundary, sur-		of Porcupine district, account of	15-19
vey by	9	Geology, economic, account of	19
Copper, occurrence of	27	Girty, G. H., fossils determined by	16

	Page.		Page.
Glacial mud, value of	20	Location of Porcupine district	9
Glaciation in Porcupine district, evidences of	14, 18-19	McClellan Flats, location of	10
Glacier Creek, claims staked on	12	McDonald, Captain, acknowledgments to ..	11
rush to	12	McKinley Creek, claims and developments on	24-26
transfer of, to the United States	12	claims staked on	12
Gold, character of	20	geologic section on	25
concentration of	18-19, 21	gold-bearing calcite veins on	18
discovery of, in Porcupine district	9, 12	gold-bearing gravels on, limits of	31
on Bowlder Creek	12	gravels on	91
on Porcupine Creek	12	rush to	12
occurrence of	20-27	views on	18, 24
output of	9, 13	McKinley Creek Mining Company, property of	25-26
source of	20	McKinley Falls, location of	24
Gold-bearing ores and gravels, assays of ..	20	Map of Porcupine district	10
Gold claims on Porcupine Creek, examination of, by A. H. Brooks	9	of Porcupine district, statement concerning	9, 15
Granite Mountain, glaciation on	18	Map, geologic, of vicinity of Porcupine ..	16
Gravels, occurrence of	18	of vicinity of Porcupine, reference to ..	15, 19
Gravels, auriferous, classification of	19	Marble, occurrence of	16
distribution of	19	Marble Creek, claims staked on	12
limits of	31	rush to	12
location of, on Glacier Creek	19	Metamorphic belt, character and course of ..	15
on Klehini River	22	Mineralization, zone of	17
on Nugget Creek	19, 26	Mining in Porcupine district by elevators, view of	20
on Porcupine River	19	in Porcupine district, methods of	28-29
on Salmon River	27	Minister of mines of Canada, quoted on Rainy Hollow district	28
on tributaries of the Klehini	19	Mix, S. W., acknowledgments to	11
Gravels, creek, character and location of ..	19	exploration by	12
value of	31	Mix claim, description of	24
Gravels, high bench, character and location of	19	Modus vivendi, effect of	12
view of	22	Mountains in Porcupine district, character and height of	14
Gravels, side bench, character and location of	19	Nugget Creek, claims and developments on ..	26
value of	31	course of	13
Grizzly Creek, claims staked on	12	discovery of gold on	13
Ground sluicing, example of	25	gold-bearing gravels on, limits of	31
method of	28-29	placers of	11
view of	24	trails to	26
Haines Mission, location of	10	source and course of	26
view of	9	O'Connor, J. M., acknowledgments to	11
Hall claim, mention of	24	Paleozoic age, rocks of	15
Hanley, E. B., acknowledgments to	11	Peters, W. J., exploration under lead of	9
Hartford ledge, description of	27	Placer gold. <i>See</i> Gold.	
History of Porcupine district	12-13	Placers, classification of	19
Hydraulicking, use of	29	Platinum, reported occurrence of	22
views of	26	Pleasant Camp, marble near	16
Igneous rocks, character of	17	Porcupine, description of	11
Intrusive rocks, character of	17	location of	11, 14
International Boundary Commission, survey by	9	population of	11, 12
Katkwaltu, location of	10	view of	12
Ketchikan mining district, fossil from	16-17	Porcupine Creek, claims and developments on	22-24
A. H. Brooks cited on	16	discovery of gold on	12
Klehim River, character of	14	flow of	30
gold of gravels of	22	geologic section on	25
mouth of	11	gold-bearing gravels on, limits of	31
quartz ledge near	18	gravel at mouth of	14
rocks on	17	map of	21
trail by	10	mining on, methods of	28-29
Klukwan, location of	10	quartz ledge near	18
population of	11	views on	14, 18
Legal Tender traction, description of	24	Porcupine Creek basin, gravels of	19
Lewis, Guy, acknowledgments to	11		
Limestone, occurrence of	16		

	Page.		Page.
Porcupine Creek placers, examination of,		Silver-bearing ores and gravels, assays of ..	20
by A. H. Brooks	9	Slates, mineralization of	17
study of	11	occurrence of	16
Prospectors, rush to Porcupine district by ..	12-13	Slates, mineralized, source of gold in	20-21, 31
	21-22	Sluice boxes, size and character of	29
rush to Rainy Hollow district by	28	Snowfall, amount of	31
Quartz ledge, occurrence and character of ..	18	Spencer, Dr. A. C., acknowledgments to ...	11
Quartz veins, occurrence and character of ..	18	cited on Alaskan rocks	15
Rainy Hollow district, assays of ores from ..	28	Supplies, transportation of	30
claims in	28	Surveys in Porcupine district, mention of ..	9
examination of	27	Throp's trail, use of	30
location and character of	11, 27	Topography of Porcupine district, charac-	
rush to	28	ter of	14-15
Rant, Captain, hospitality of	11	Trails. <i>See</i> Routes.	
Reconnaissance by A. H. Brooks	9	United Gold Mining Company, property of ..	24-25
Rifles, kinds of	29	Water supply, amount of	30
Ripinski, Mount, view from	9	Wells Post, location of	11
River beds, value of	31	Wiley, —, exploration by	12
Routes to Porcupine region, account of	10, 30	Wiley claim, mention of	24
Salmon River, bench on	27	Woodin claim, description of	25-26
claims on	27	geologic section at	25
discovery of gold on	13	view below	24
Schist, occurrence of	17	view of	18, 26
Sedimentary belt, character and course of ..	15	Wright, C. W., assignment to Porcupine re-	
fossils of	16-17	gion of	9
gold-bearing creeks of	16	route followed by	10
Sedimentary rocks, mineralization of	17	Yendestaka, location of	10
Silver, occurrence of	27		

PUBLICATIONS OF UNITED STATES GEOLOGICAL SURVEY.

[Bulletin No. 236.]

The serial publications of the United States Geological Survey consist of (1) Annual Reports, (2) Monographs, (3) Professional Papers, (4) Bulletins, (5) Mineral Resources, (6) Water-Supply and Irrigation Papers, (7) Topographic Atlas of United States—folios and separate sheets thereof, (8) Geologic Atlas of United States—folios thereof. The classes numbered 2, 7, and 8 are sold at cost of publication; the others are distributed free. A circular giving complete lists may be had on application.

The Bulletins, Professional Papers, and Water-Supply Papers treat of a variety of subjects, and the total number issued is large. They have therefore been classified into the following series: A, Economic geology; B, Descriptive geology; C, Systematic geology and paleontology; D, Petrography and mineralogy; E, Chemistry and physics; F, Geography; G, Miscellaneous; H, Forestry; I, Irrigation; J, Water storage; K, Pumping water; L, Quality of water; M, General hydrographic investigations; N, Water power; O, Underground waters; P, Hydrographic progress reports. This bulletin is the thirty-seventh in Series A and the forty-second in Series B, the complete lists of which follow. (B = Bulletin, PP = Professional Paper.)

SERIES A, ECONOMIC GEOLOGY.

- B 21. Lignites of Great Sioux Reservation: Report on region between Grand and Moreau rivers, Dakota, by Bailey Willis. 1885. 16 pp., 5 pls. (Out of stock.)
- B 46. Nature and origin of deposits of phosphate of lime, by R. A. F. Penrose, jr., with introduction by N. S. Shaler. 1888. 143 pp. (Out of stock.)
- B 65. Stratigraphy of the bituminous coal field of Pennsylvania, Ohio, and West Virginia, by I. C. White. 1891. 212 pp., 11 pls. (Out of stock.)
- B 111. Geology of Big Stone Gap coal field of Virginia and Kentucky, by M. R. Campbell. 1893. 106 pp., 6 pls.
- B 132. The disseminated lead ores of southeastern Missouri, by Arthur Winslow. 1896. 31 pp.
- B 138. Artesian-well prospects in Atlantic Coastal Plain region, by N. H. Darton. 1896. 228 pp., 19 pls. (Out of stock.)
- B 139. Geology of Castle Mountain mining district, Montana, by W. H. Weed and L. V. Pirsson. 1896. 164 pp.; 17 pls.
- B 143. Bibliography of clays and the ceramic arts, by J. C. Branner. 1896. 114 pp.
- B 164. Reconnaissance on the Rio Grande coal fields of Texas, by T. W. Vaughan, including a report on igneous rocks from the San Carlos coal field, by E. C. E. Lord. 1900. 100 pp., 11 pls.
- B 178. El Paso tin deposits, by W. H. Weed. 1901. 15 pp., 1 pl.
- B 180. Occurrence and distribution of corundum in United States, by J. H. Pratt. 1901. 98 pp., 14 pls.
- B 182. A report on the economic geology of the Silverton quadrangle, Colorado, by F. L. Ransome. 1901. 266 pp., 16 pls.
- B 184. Oil and gas fields of the western interior and northern Texas Coal Measures and of the Upper Cretaceous and Tertiary of the western Gulf coast, by G. I. Adams. 1901. 64 pp., 10 pls. (Out of stock.)
- B 193. The geological relations and distribution of platinum and associated metals, by J. F. Kemp. 1902. 95 pp., 6 pls. (Out of stock.)
- B 198. The Berca grit oil sand in the Cadiz quadrangle, Ohio, by W. T. Griswold. 1902. 43 pp., 1 pl.
- PP 1. Preliminary report on the Ketchikan mining district, Alaska, with an introductory sketch of the geology of southeastern Alaska, by Alfred Hulse Brooks. 1902. 120 pp., 2 pls.
- B 200. Reconnaissance of the borax deposits of Death Valley and Mohave Desert, by M. R. Campbell. 1902. 23 pp., 1 pl.
- B 202. Tests for gold and silver in shales from western Kansas, by Waldemar Lindgren. 1902. 21 pp.
- PP 2. Reconnaissance of the northwestern portion of Seward Peninsula, Alaska, by A. J. Collier. 1902. 70 pp., 11 pls.

- PP 10. Reconnaissance from Fort Hamlin to Kotzebue Sound, Alaska, by way of Dall, Kanuti, Allen and Kowak rivers, by W. C. Mendenhall. 1902. 68 pp., 10 pls.
- PP 11. Clays of the United States east of the Mississippi River, by Heinrich Ries. 1903. 298 pp., 9 pls.
- PP 12. Geology of the Globe copper district, Arizona, by F. L. Ransome. 1903. 168 pp., 27 pls.
- B 212. Oil fields of the Texas-Louisiana Gulf Coastal Plain, by C. W. Hayes and William Kennedy. 1903. 174 pp., 11 pls.
- B 213. Contributions to economic geology, 1902; S. F. Emmons, C. W. Hayes, geologists in charge. 1903. 449 pp.
- PP 15. The mineral resources of the Mount Wrangell district, Alaska, by W. C. Mendenhall and F. C. Schrader. 1903. 71 pp., 10 pls.
- B 218. Coal resources of the Yukon, Alaska, by A. J. Collier. 1903. 71 pp., 6 pls.
- B 219. The ore deposits of Tonopah, Nevada (preliminary report), by J. E. Spurr. 1903. 31 pp., 1 pl.
- PP 20. A reconnaissance in northern Alaska, in 1901, by F. C. Schrader. 1904. 139 pp., 16 pls.
- PP 21. Geology and ore deposits of the Bisbee quadrangle, Arizona, by F. L. Ransome. 1904. 168 pp., 29 pls.
- B 223. Gypsum deposits of the United States, by G. I. Adams and others. 1904. 129 pp., 21 pls.
- PP 24. Zinc and lead deposits of northern Arkansas, by G. I. Adams. 1904. 118 pp., 27 pls.
- PP 25. Copper deposits of the Encampment district, Wyoming-Colorado, by A. C. Spencer. 1904. 107 pp., 2 pls.
- B 225. Contributions to economic geology, 1903; S. F. Emmons, C. W. Hayes, geologists in charge. 1904. 527 pp., 1 pl.
- PP 26. Economic resources of the northern Black Hills, by J. D. Irving, with contributions by S. F. Emmons and T. A. Jaggar, jr. 1904. 222 pp., 20 pls.
- PP 27. A geological reconnaissance across the Bitterroot Range and Clearwater Mountains in Montana and Idaho, by Waldemar Lindgren. 1904. 123 pp., 15 pls.
- B 229. Tin deposits of the York region, Alaska, by A. J. Collier. 1904. 61 pp., 7 pls.
- B 236. The Porcupine placer district, Alaska, by C. W. Wright. 1904. 35 pp., 10 pls.

SERIES B, DESCRIPTIVE GEOLOGY.

- B 23. Observations on the junction between the Eastern sandstone and the Keweenaw series on Keweenaw Point, Lake Superior, by R. D. Irving and T. C. Chamberlin. 1885. 124 pp., 17 pls.
- B 33. Notes on geology of northern California, by J. S. Diller. 1886. 23 pp. (Out of stock.)
- B 39. The upper beaches and deltas of Glacial Lake Agassiz, by Warren Upham. 1887. 84 pp., 1 pl. (Out of stock.)
- B 40. Changes in river courses in Washington Territory due to glaciation, by Bailey Willis. 1887. 10 pp., 4 pls. (Out of stock.)
- B 45. The present condition of knowledge of the geology of Texas, by R. T. Hill. 1887. 94 pp. (Out of stock.)
- B 53. The geology of Nantucket, by N. S. Shaler. 1889. 55 pp., 10 pls. (Out of stock.)
- B 57. A geological reconnaissance in southwestern Kansas, by Robert Hay. 1890. 49 pp., 2 pls.
- B 58. The glacial boundary in western Pennsylvania, Ohio, Kentucky, Indiana, and Illinois, by G. F. Wright, with introduction by T. C. Chamberlin. 1890. 112 pp., 8 pls. (Out of stock.)
- B 67. The relations of the traps of the Newark system in the New Jersey region, by N. H. Darton. 1890. 82 pp. (Out of stock.)
- B 104. Glaciation of the Yellowstone Valley north of the Park, by W. H. Weed. 1893. 41 pp., 4 pls.
- B 108. A geological reconnaissance in central Washington, by I. C. Russell. 1893. 108 pp., 12 pls. (Out of stock.)
- B 119. A geological reconnaissance in northwest Wyoming, by G. H. Eldridge. 1894. 72 pp., 4 pls.
- B 137. The geology of the Fort Riley Military Reservation and vicinity, Kansas, by Robert Hay. 1896. 35 pp., 8 pls.
- B 144. The moraines of the Missouri Coteau and their attendant deposits, by J. E. Todd. 1896. 71 pp., 21 pls.
- B 158. The moraines of southeastern South Dakota and their attendant deposits, by J. E. Todd. 1899. 171 pp., 27 pls.
- B 159. The geology of eastern Berkshire County, Massachusetts, by B. K. Emerson. 1899. 139 pp., 9 pls.
- B 165. Contributions to the geology of Maine, by H. S. Williams and H. E. Gregory. 1900. 212 pp., 14 pls.
- WS 70. Geology and water resources of the Patrick and Goshen Hole quadrangles in eastern Wyoming and western Nebraska, by G. I. Adams. 1902. 50 pp., 11 pls.
- B 199. Geology and water resources of the Snake River Plains of Idaho, by I. C. Russell. 1902. 192 pp., 25 pls.
- PP 1. Preliminary report on the Ketchikan mining district, Alaska, with an introductory sketch of the geology of southeastern Alaska, by A. H. Brooks. 1902. 120 pp., 2 pls.
- PP 2. Reconnaissance of the northwestern portion of Seward Peninsula, Alaska, by A. J. Collier. 1902. 70 pp., 11 pls.

- PP 3. Geology and petrography of Crater Lake National Park, by J. S. Diller and H. B. Patton. 1902. 167 pp., 19 pls.
- PP 10. Reconnaissance from Fort Hamlin to Kotzebue Sound, Alaska, by way of Dall, Kanuti, Allen, and Kowak rivers, by W. C. Mendenhall. 1902. 68 pp., 10 pls.
- PP 11. Clays of the United States east of the Mississippi River, by Heinrich Ries. 1903. 298 pp., 9 pls.
- PP 12. Geology of the Globe copper district, Arizona, by F. L. Ransome. 1903. 168 pp., 27 pls.
- PP 13. Drainage modifications in southeastern Ohio and adjacent parts of West Virginia and Kentucky, by W. G. Tight. 1903. 111 pp., 17 pls.
- 3 208. Descriptive geology of Nevada south of the fortieth parallel and adjacent portions of California, by J. E. Spurr. 1903. 229 pp., 8 pls.
- 3 209. Geology of Ascutney Mountain, Vermont, by R. A. Daly. 1903. 122 pp., 7 pls.
- VS 78. Preliminary report on artesian basins in southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903. 51 pp., 2 pls.
- PP 15. Mineral resources of the Mount Wrangell district, Alaska, by W. C. Mendenhall and F. C. Schrader. 1903. 71 pp., 10 pls.
- PP 17. Preliminary report on the geology and water resources of Nebraska west of the one hundred and third meridian, by N. H. Darton. 1903. 69 pp., 43 pls.
- 3 217. Notes on the geology of southwestern Idaho and southeastern Oregon, by I. C. Russell. 1903. 83 pp., 18 pls.
- 3 219. The ore deposits of Tonopah, Nevada (preliminary report), by J. E. Spurr. 1903. 31 pp., 1 pl.
- PP 20. A reconnaissance in northern Alaska in 1901, by F. C. Schrader. 1904. 139 pp., 16 pls.
- PP 21. The geology and ore deposits of the Bisbee quadrangle, Arizona, by F. L. Ransome. 1904. 168 pp., 29 pls.
- VS 90. Geology and water resources of part of the lower James River Valley, South Dakota, by J. E. Todd and C. M. Hall. 1904. 47 pp., 23 pls.
- PP 25. The copper deposits of the Encampment district, Wyoming, by A. C. Spencer. 1904. 107 pp., 2 pls.
- PP 26. Economic resources of northern Black Hills, by J. D. Irving, with chapters by S. P. Emmons and T. A. Jaggar, jr. 1904. 222 pp., 20 pls.
- PP 27. Geological reconnaissance across the Bitterroot Range and the Clearwater Mountains in Montana and Idaho, by Waldemar Lindgren. 1904. 122 pp., 15 pls.
- PP 31. Preliminary report on the geology of the Arbuckle and Wichita mountains in Indian Territory and Oklahoma, by J. A. Taff, with an appendix on reported ore deposits in the Wichita Mountains, by H. F. Bain. 1904. 97 pp., 8 pls.
235. A geological reconnaissance across the Cascade Range near the forty-ninth parallel, by G. O. Smith and F. C. Calkins. 1904. 103 pp., 4 pls.
236. The Porcupine placer district, Alaska, by C. W. Wright. 1904. 35 pp., 10 pls.

Correspondence should be addressed to

THE DIRECTOR,

UNITED STATES GEOLOGICAL SURVEY,

WASHINGTON, D. C.

OCTOBER, 1904.

LIBRARY CATALOGUE SLIPS.

[Mount each slip upon a separate card, placing the subject at the top of the second slip. The name of the series should not be repeated on the series card, but the additional numbers should be added, as received, to the first entry.]

Wright, Charles W.

Author.

. . . The Porcupine placer district, Alaska, by Charles W. Wright. Washington, Gov't print. off., 1904.

35, III p. illus., 10 pl. (incl. maps) 23½^{cm}. (U. S. Geological survey. Bulletin no. 236.)

Subject series: A, Economic geology, 37; B, Descriptive geology, 42.

Wright, Charles W.

Subject.

. . . The Porcupine placer district, Alaska, by Charles W. Wright. Washington, Gov't print. off., 1904.

35, III p. illus., 10 pl. (incl. maps) 23½^{cm}. (U. S. Geological survey. Bulletin no. 236.)

Subject series: A, Economic geology, 37; B, Descriptive geology, 42.

U. S. Geological survey.

Series.

Bulletins.

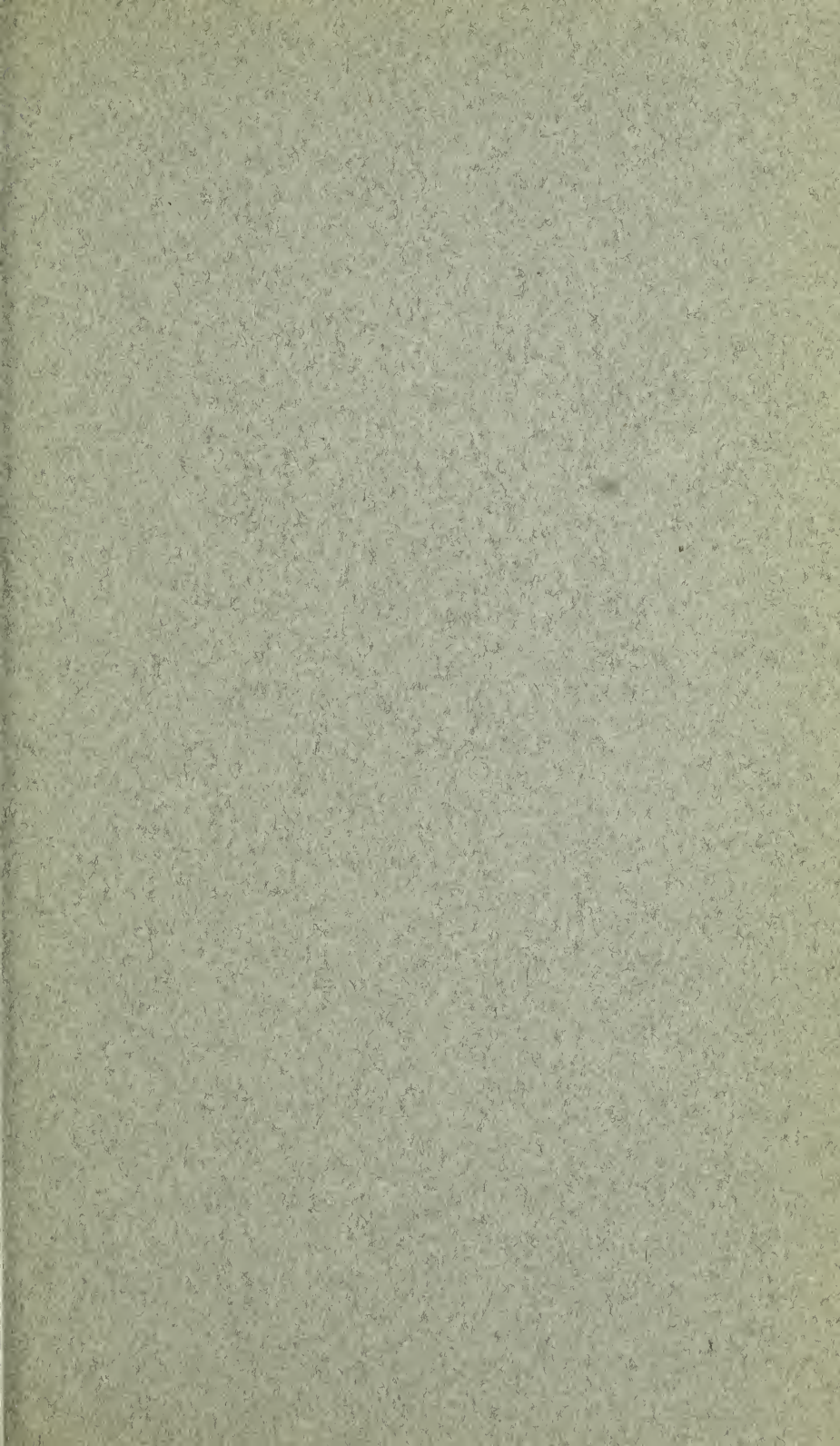
no. 236. Wright, C. W. The Porcupine placer district, Alaska. 1904.

Reference.

U. S. Dept. of the Interior.

see also

U. S. Geological survey.



THE
LIBRARY
OF THE
MUSEUM
OF
ART AND
ARCHAEOLOGY
OF THE
UNIVERSITY OF
CAMBRIDGE
1871

